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Helicopter Visual Segment Approach Lighting System (HALS) Test Report

Barry R. Billmann
Scott Shollenberger

June 1989

DOT/FAA/CT-TN89/21

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16. Abstract

This Technical Note reports on a test designed to obtain pilot performance subjective pilot data on the Helicopter Visual Segment Approach Lighting System (HALS). Results identify the performance measures which correlate with the pilot's ability to visually acquire a HALS equipped heliport. Conclusions state that HALS can support existing minima to heliports. Pilots reported unacceptable Cooper-Harper ratings for rate of closure and workload without HALS.

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EXECUTIVE SUMMARY

This Technical Note reports on a test designed to obtain pilot performance subjective pilot data on the Helicopter Visual Segment Approach Lighting System (HALS). Results identify the performance measures which correlate with the pilot's ability to visually acquire a HALS equipped heliport. Conclusions state that HALS can support existing minima to heliports. Pilots reported unacceptable Cooper-Harper ratings for rate of closure and workload without HALS.

INTRODUCTION

BACKGROUND.

The establishment of precision instrument approaches to heliports is hindered by the visual segment guidance which currently exists at most urban area heliports. In the visual segment area, inside and below the decision height (DH) location on precision approach, the pilot normally operates the helicopter uncued through visual reference to the landing environment. The unique handling qualities of helicopters may require enhanced visual segment guidance. The Heliport Versus Segment Approach Lighting System (HALS) has been developed to meet this requirement. However, until now, no flight data in conjunction with MLS approaches had been collected.

TEST PROCEDURES

LOCATION.

The flight testing was conducted from April to June 1988 at the Federal Aviation Administration (FAA) National Concepts Development and Demonstration Heliport located in Atlantic City, New Jersey. The heliport is located at the north end of the Technical Center, with an obstacle free approach course providing the necessary flexibility for the flight tests. The heliport and surrounding airspace is in clear view of the ground tracking facilities.

SUPPORT EQUIPMENT.

AIRCRAFT. Through the FAA's Interagency Agreement with the Department of the Army, the flight test vehicle used was the UH-1H helicopter, tail number 70-16344 (reference 1 and appendix A). The UH-1H (Bell 205) helicopter is equipped with a horizontal situation indicator (HSI), which combines course deviation indicator (CDI) information along with the slaved magnetic heading, for course guidance. Distance measuring equipment/precision (DME/P) will be used for distance and decision height (DH) information. The safety/project pilot, in addition to the preflight briefing, performed the outbound flight, course setup, radio communications, and annunciated decision height (DH) information.

MICROWAVE LANDING SYSTEM (MLS). The MLS equipment currently installed at the FAA's Demonstration and Concepts Development Heliport is a prototype system manufactured by the Hazeltine Corporation. The system, a model 2400, is a low profile precision approach and landing system utilizing microwave phased array antenna technology, microprocessor control, and solid-state electronics. The time reference scanning beam (TRSB) format is transmitted on one of 200 C-band (4 to 8 gigahertz (GHz)) frequency channels.

The scanning beams are traversed rapidly (39 times a second for elevation and 13 times a second for azimuth) "TO" and "FRO" throughout the coverage volume. Each aircraft receiving these beams derives its own position angle directly from the time difference between the TRSB beam pulse pairs. In addition, data such as airport and runway identification, course clearance sector size, and other operational data are transmitted on the same channel. The equipment recently

underwent modification to conform to the International Civil Aviation Organization (ICAO) 08C format (reference 2). This permits the model 2400 system to be interoperable with Cabin Class MLS receivers.

The azimuth proportional guidance is provided in a sector -10° to +10° from the approach course centerline. Clearance guidance provides a full scale fly left or fly right presentation to the pilot. The clearance sectors are from -40° to -10° and +10° to +40° about the approach course centerline. Table 1 presents the characteristics of the model 2400 system.

HALS. The HALS being evaluated consists of the Basic Instrument Flight Rules (IFR) Heliport Lighting System and a centerline HALS. The Basic IFR Approach Light System is presented in figure 1. It consists of perimeter lights around the final approach and take-off area, wing light bars, and edge light bars. Also, in-pad centerline touchdown lights are included. The centerline HALS shown in figure 2 consists of a series of approach light bars spaced at 100-foot intervals for a distance of 800 feet. Although the HALS is reconfigurable, only the described configuration was evaluated during the test. The described configuration conforms to the approach light system in AC/50/5390-2 (reference 3).

In addition to the heliport lighting, a visual glideslope indicator (VGSI) was used. The VGSI located at the heliport is set for guidance at 6° elevation angle. The VGSI provided the pilot with a well below glidepath indication when the aircraft was on an elevation angle less than 4.5°; below glidepath when the aircraft was between a 4.5° and 5.5° elevation angle; on glidepath between 5.5° and 6.5° elevation angles; above glidepath for elevation angles between 6.5° and 7.5° and well above glidepath for elevation angles greater than 7.5°.

Four different lighting combinations were tested. The minimum condition tested consisted of the Basic IFR Heliport Lighting System. The second condition consisted of the Basic IFR System augmented with a VGSI system. The third condition consisted of the Basic IFR System augmented with the HALS. The final lighting configuration tested consisted of the Basic IFR System augmented with both the HALS and VGSI.

AIRBORNE DATA COLLECTION SYSTEM. The airborne data recording system on the UH-1H is a 6809 microprocessor-based package, which is a combination of an off-the-shelf data package and FAA designed interface boards. The system is capable of recording the parameters listed in table 2 for storage on a Kennedy magnetic tape recorder on magnetic tape media. The sensitive equipment was shock mounted against helicopter vibration.

Independent variables for this test were glidepath angle (3°, 4.5°, and 6°), intensity of the Heliport IFR Approach Lighting System (HALS) (step 3 maximum and step 1 minimum), with and without the extended centerline approach lighting system, centerline and left/right offset approaches, missed approach option, and visibility distance (0.25, 0.50, 0.75, and 1.00 mile visibilities). Dependent variables were 250-foot DH for 3° and 4.5° approaches, 350-foot DH for 6° approaches; the HALS was always active but the extended centerline approach lighting was turned on and off, and all flights were flown at night with variable aperture foggles.

TABLE 1. HAZELTINE MODEL 2400 MLS TECHNICAL SPECIFICATIONS

Function	AZ	EL
Beam Width	3.5°	2.4°
Course Width	±3.6°	EL angle/3°
Proportional Sector	±10°	1 to 15°
Clearance Sector	±10 to ±40°	Full fly up below 1°
Range	20 nmi	20 nmi
Antenna Aperture Size	5 ft x 3.5 ft	6 in x 6 ft
Phase Shifters	8	8
Transmitter Power	10 W nominal	5 W nominal

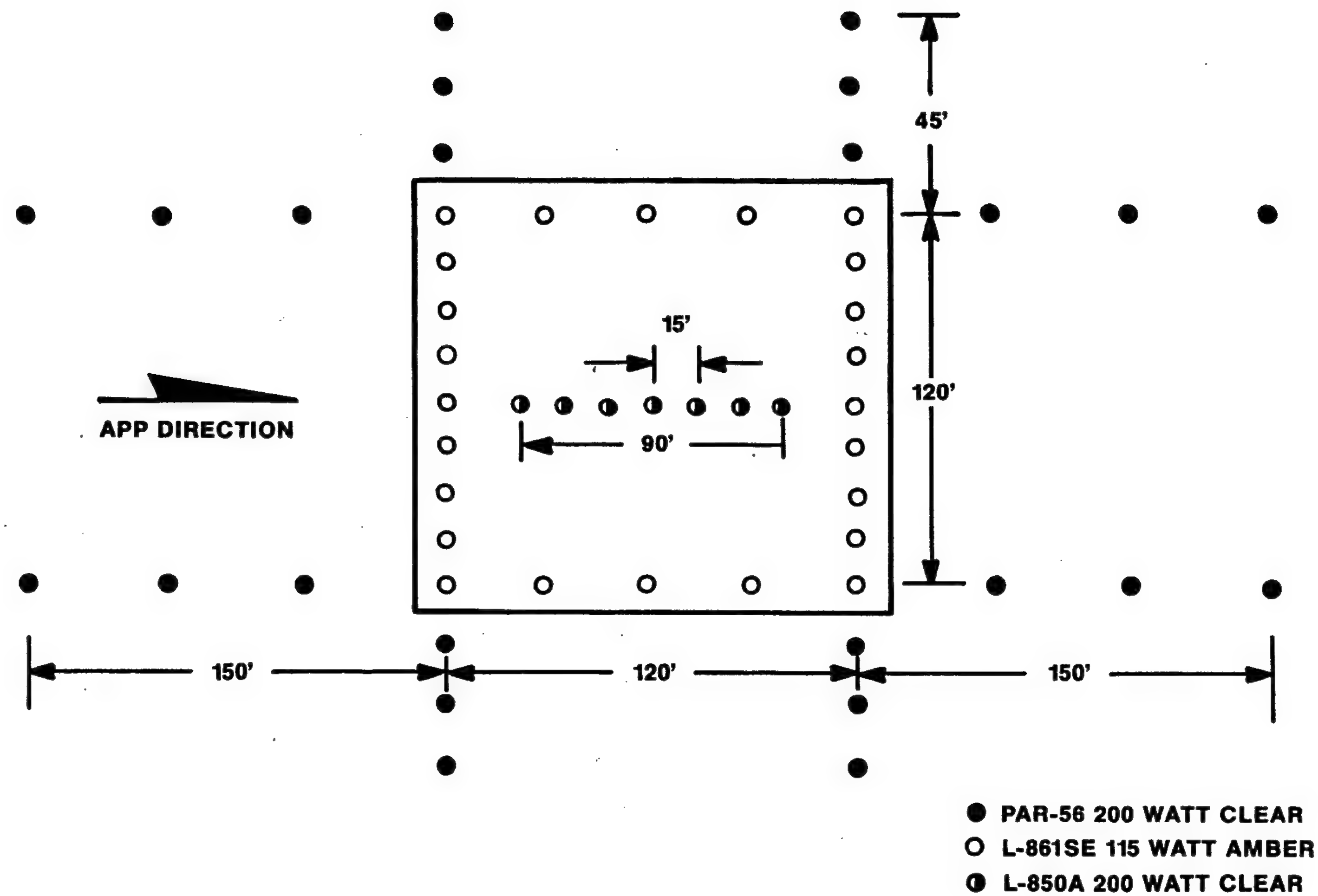


FIGURE 1. BASIC HELIPORT IFR LIGHTING SYSTEM

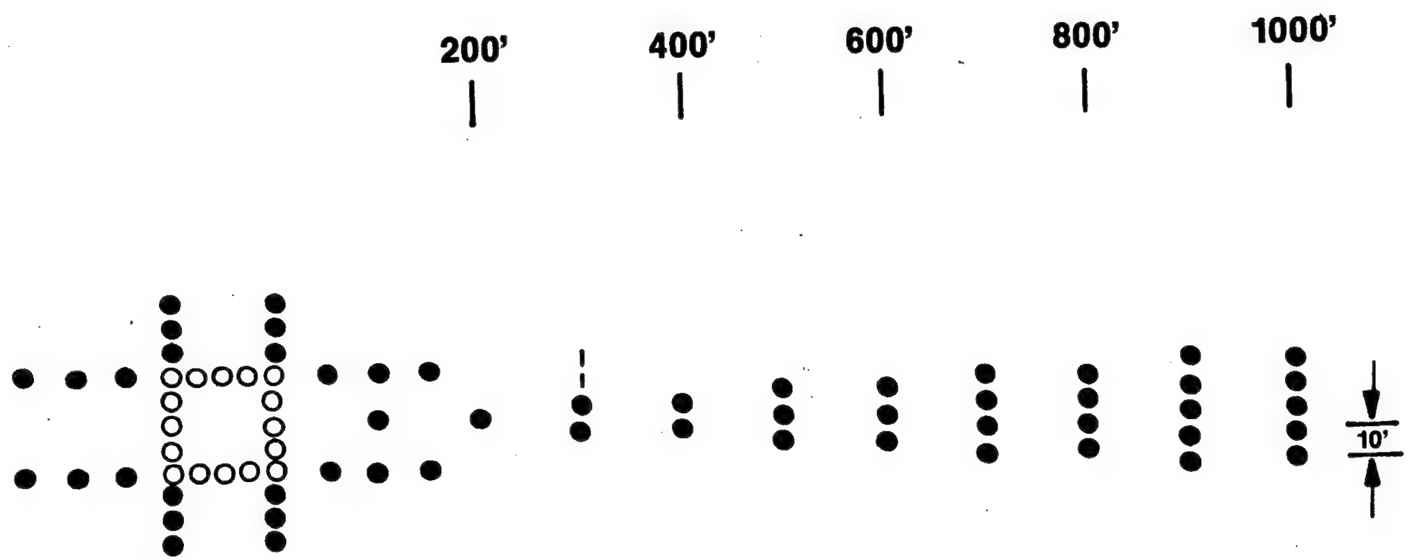


FIGURE 2. HELIPORT APPROACH LIGHTING SYSTEM

TABLE 2. RECORDING RATES USED FOR DATA COLLECTION

Parameter	Units	Sample Rate (Hz)	Resolution
Time	hrs/min/sec	39	0.001 sec
Indicated Airspeed	knots	2/5	0.0977 knots
Vertical Velocity	feet/min	2/5	0.488 fpm
Magnetic Heading	degrees	2/5	0.002 degrees
Barometric Altitude	feet	2/5	1.95 feet
Radio Altimeter	feet	2/5	0.732 feet
MLS Horizontal Deviation (low)	microamps	2/5	0.02 microamps
MLS Vertical Deviation (low)	microamps	2/5	0.02 microamps
MLS Azimuth	degrees	19/39	0.005 degrees
MLS Elevation	degrees	39	0.005 degrees
DME	feet	2/5	3 feet (DME/P) 60 feet (ARINC)
Digital MLS Flags	-	19/39	-
Navigation Flags	volts	5	discrete
Transverse Acceleration	32.15 ft/sec	2/5	0.0012 g's
Longitudinal Acceleration	g's	2/5	0.0012 g's
Vertical Acceleration	g's	2/5	0.0049 g's
Time Code Generator Time	milliseconds	-	0.001 seconds
MLS Azimuth Deviation	millivolts	5	0 - 300mV
MLS Elevation Deviation	millivolts	5	0 - 300mV

INSTRUMENT METEROLOGICAL CONDITIONS (IMC) SIMULATOR FOGGLES. The IMC simulator foggles simulate IMC. When the IMC glasses are properly adjusted, the pilot maintains a clear, unrestricted view of the instrument and radio panels by means of the unique trifocal area of the Visitron lenses. The selected lower inside quadrants of the Visitron lenses are clear until the pilot looks outside the cockpit, at which time the Visitron lenses obscure instantly to a preset Runway Visual Range (RVR) setting. At all times the pilot has normal peripheral vision, limited only by the preset RVR selected. The pilot also has free head and eye movement and can look outside the cockpit for visual clues with limited vision. The safety pilot has minimum work load, and all switch changes and settings can be accomplished in less than 3 seconds. If the subject pilot were to get into a situation where safety is in any way compromised, the safety pilot can push the ON/OFF toggle switch to the OFF/VMC position. Instantly, the obscuration clears and the pilot has clear viewing.

QUESTIONAIRES.

Following each approach, subject pilots were questionned concerning:

1. Overall visual segment rating

2. Assistance in visual alignment for landing

3. Deceleration cueing

4. Overall workload

5. Aircraft Controlability

This questionnaire information was recorded after each profile run. The Cooper-Harper ratings were reduced to mean and standard deviations. Copies of the inflight questionnaire, post-flight questionnaire, and the post-flight pilot background questionnaire are in appendix B.

FLIGHT PROFILES.

Approach profiles flown replicated elevation angle and DH/visibility combinations which had previously been identified with heliport Terminal Instrument Procedures (TERPS) development activities. Table 3 presents the elevation angle/DH combinations which were flown.

TABLE 3. TEST EVALUATION/DH COMBINATIONS

	Elevation Angle (degrees)		
	3.0	4.5	6.0
DH (ht above heliport)	200	250	250
Visibility (statute mi)	3/4	1/2	1/2

In order to more realistically evaluate the HALS, both centerline and offset azimuth approaches were flown. The offset approaches were flown using offsets of 5° both left and right of the final approach course centerline. This permitted evaluation of HALS performance in aiding the pilot to align and land the aircraft

when he arrives at DH in a position that represents more than full scale lateral deviation from the desired final approach course.

The visibility test condition was compared with the slant range distance from the heliport center to DH for each test profile. This comparison is presented in table 4.

TABLE 4. VISIBILITY VS. SLANT RANGE DISTANCE TO THE HELIPORT

Approach Angle (degrees)	DH (ft)	Visibility (Statute mi)	Slant Range (Ft)
3.0	200	3/4 (396 ft)	3821
4.5	250	1/2 (2640 ft)	3186
6.0	250	1/2 (2640 ft)	2391

Table 4 indicates that with the 3° and 6° approaches the subject pilot should be able to see the heliport and all approach aids at DH. However, on the 4.5° approach, only the HALS lights would initially be in view at DH.

SUBJECT PILOTS.

The subject pilots who participated in this test came from industry, the FAA, and the military. All subjects were current and qualified in the UH-1H and held at least an FAA commercial rotorcraft and instrument rating. Total helicopter flight time of the subject pilots ranged from 600 to over 12,000 hours. Time in type ranged from as low as 75 hours to 5100 hours. A total of seven subject pilots participated in the testing. Also, test profiles were flown by a pilot from AVN-210 who didn't participate in the evaluation of the lighting systems. Subject pilot background profiles can be reviewed in appendix C.

ANALYSIS OF RESULTS

The test design called for all subjects to complete two flights. However, one flight was lost due to MLS equipment failure. A second flight was lost due to foggle failure. A total of 12 data collection flights were completed. The test scenario for a single flight is shown in table 5.

SUBJECT PILOT QUESTIONNAIRE ANALYSIS.

Following each approach the subject pilot was asked a series of five questions concerning characteristics of the lighting system that was just used for the approach. The pilot's response to each question was a numerical score ranging from 1 to 10 based on the Modified Cooper-Harper Pilot Rating Scale. Prior to each flight the subject pilot was briefed on the use of the Modified Cooper-Harper Rating Scale, which is presented in figure 3. A pilot rating of 1 to 3 resulted if the subject felt that particular light system characteristic in question would permit routine use of that light system for completion of a precision approach to the heliport. A numerical rating between 4 and 6 indicates the subject would only rarely use the light system. A rating of 7 or greater

indicated the pilot's evaluation of the characteristic in question rendered the light system unacceptable for use. Subject pilot responses to each question are reviewed below.

TABLE 5. TEST SCENARIO

Approach Number	DH (ft)	Elevation Angle (degrees)	Azimuth Angle (degrees)	Light Configuration
1	200	3.0	143*	BASIC + HALS
2	200	3.0	143	BASIC
3	200	3.0	138	BASIC + HALS
4	200	3.0	148	BASIC
5	250	4.5	143	BASIC + HALS
6	250	4.5	138	BASIC
7	250	4.5	148	BASIC + HALS
8	250	6.0	143	BASIC + HALS
9	250	6.0	138	BASIC + VGSI
10	250	6.0	148	BASIC + HALS + VGSI

* Centerline Azimuth

OVERALL RATING. Following the approach the pilot was asked, "Did the lighting system displayed for use during the approach provide sufficient guidance at DH to allow you to complete the approach to landing visually?" Figure 4 presents the mean pilot responses +/- one standard deviation. The mean rating for the lighting configuration indicated the pilots would routinely make precision instrument approaches to heliports when HALS were available. The addition of the VGSI significantly improved the overall rating.

Figure 5 presents the four histograms of pilot responses for the Overall rating. With only the Basic IFR System available, 65 percent of the responses rated the system unacceptable or would only consider it for rare use. With the addition of HALS almost 70 percent of the responses indicated the pilot would use the system routinely. When the HALS and VGSI were available, all responses indicated the pilot would routinely use the system.

ALIGNMENT RATING. The second question asked following each approach was, "Did the lighting system displayed provide adequate alignment guidance to permit proper maneuvering to the centerline of the heliport prior to landing?" A plot of the mean response +/- one standard deviation is presented in figure 6. Again, with the presence of HALS the mean + one standard deviation indicated the system was acceptable for routine use. Without HALS the pilot responses were significantly higher, indicating an aversion to routine use when HALS was not available.

Histograms of the pilot responses to the alignment question are presented in figure 7. Without HALS or the VGSI, less than 50 percent of the responses indicated alignment was sufficient for routine use. More than 98 percent of the responses indicated alignment was sufficient for routine use when HALS was available.

MODIFIED COOPER—HARPER RATING SCALE

ACCEPTABILITY OF SAFETY MARGINS, TASK PERFORMANCE, AND PILOT WORKLOAD	GENERAL CHARACTERISTICS	SAFETY MARGINS	DEMANDS ON THE PILOT	PILOT RATING
Acceptable for routine operations ? — YES	Excellent Highly Desirable	Clearly adequate	Pilot compensation not a factor for desired performance	1
	Good Negligible Deficiencies	Clearly adequate	Pilot compensation not a factor for desired performance	2
	Fair — Some Mildly Unpleasant Deficiencies	Clearly adequate	Minimal pilot compensation required for desired performance	3
NO → Acceptable for rare occasions, e.g. FCS failure or severe atmospheric conditions? — YES	Minor but annoying deficiencies	Clearly adequate	Desired performance requires moderate pilot compensation	4
	Moderately objectionable deficiencies	Adequate	Adequate performance requires considerable pilot compension	5
	Very objectionable but tolerable deficiencies	Marginal	Adequate performance requires extensive pilot compension	6
NO → Controllable ? — YES	Major deficiencies	Inadequate	Adequate performance not attainable with maximum tolerable pilot compensation Controllability not in question	7
	Major deficiencies	Inadequate	Considerable pilot compensation is required for control	8
	Major deficiencies	Inadequate	Intense pilot compensation is required to retain control	9
NO	Major deficiencies	None	Control will be lost during some portion of required operation	10

Pilot Decisions

FIGURE 3. COOPER HARPER RATING SCALE

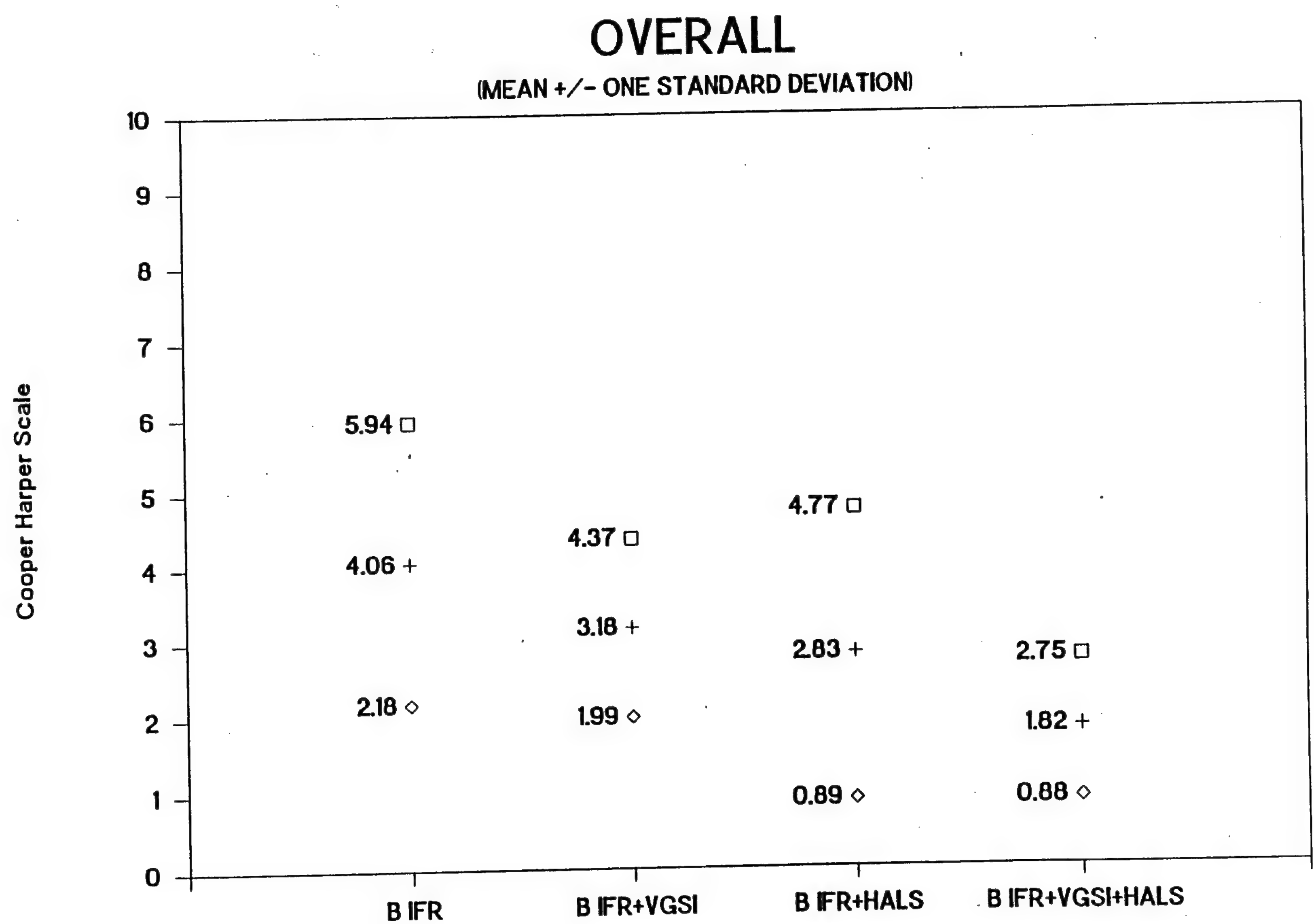
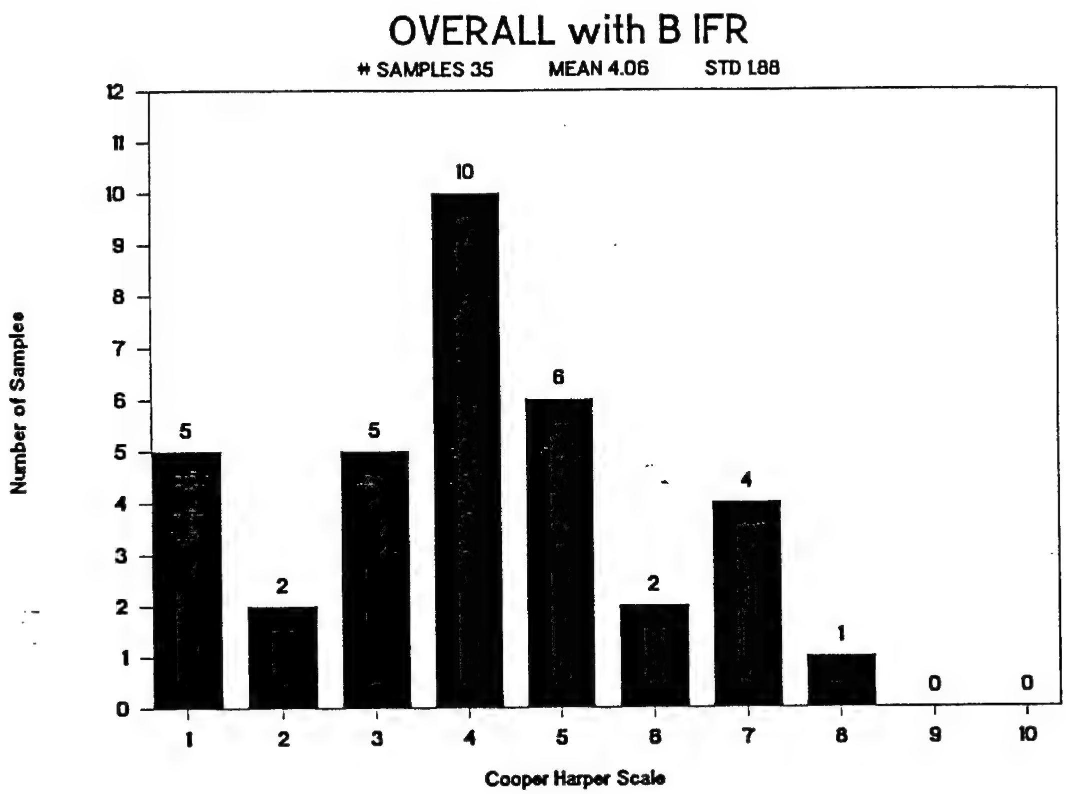


FIGURE 4. OVERALL RATING PILOT RESPONSE



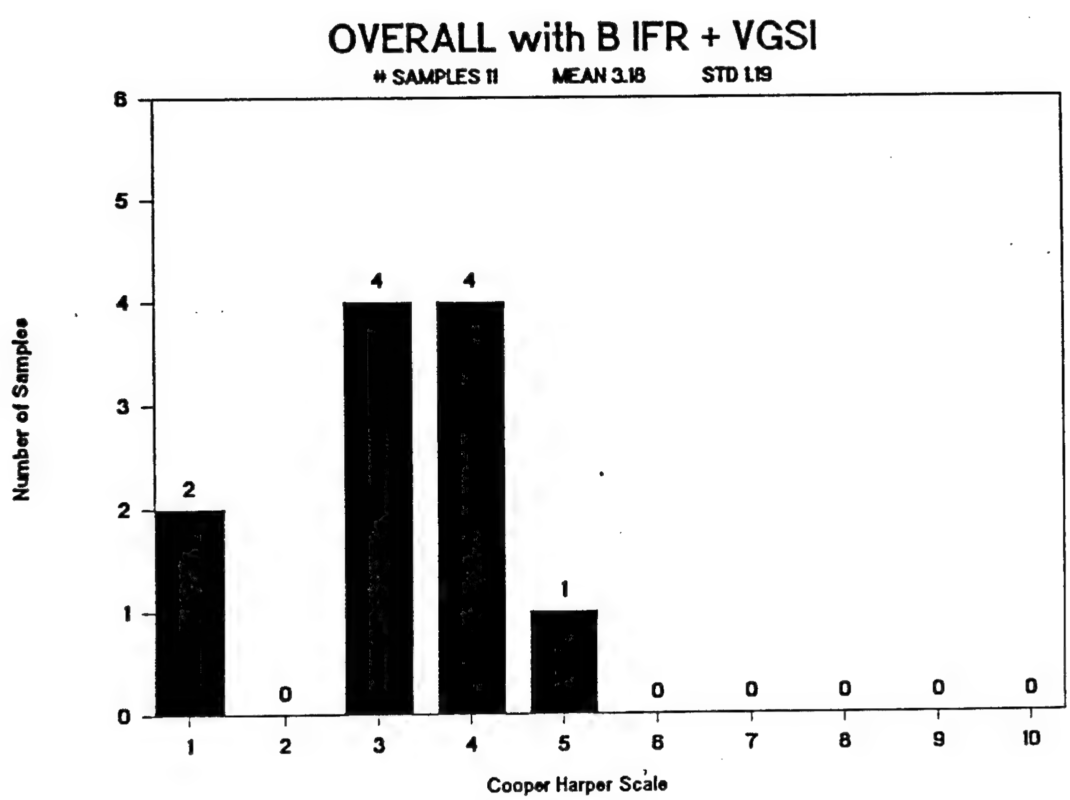
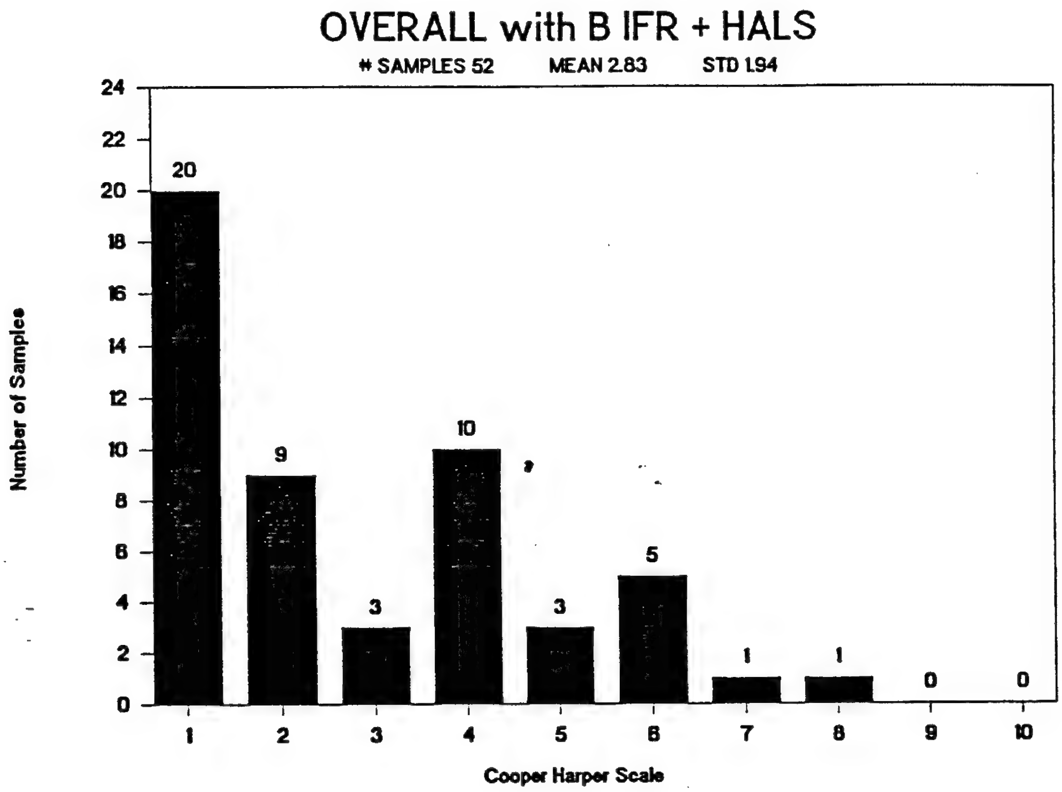


FIGURE 5. OVERALL RATING HISTOGRAM OF PILOT RESPONSE (SHEET 1 OF 2)



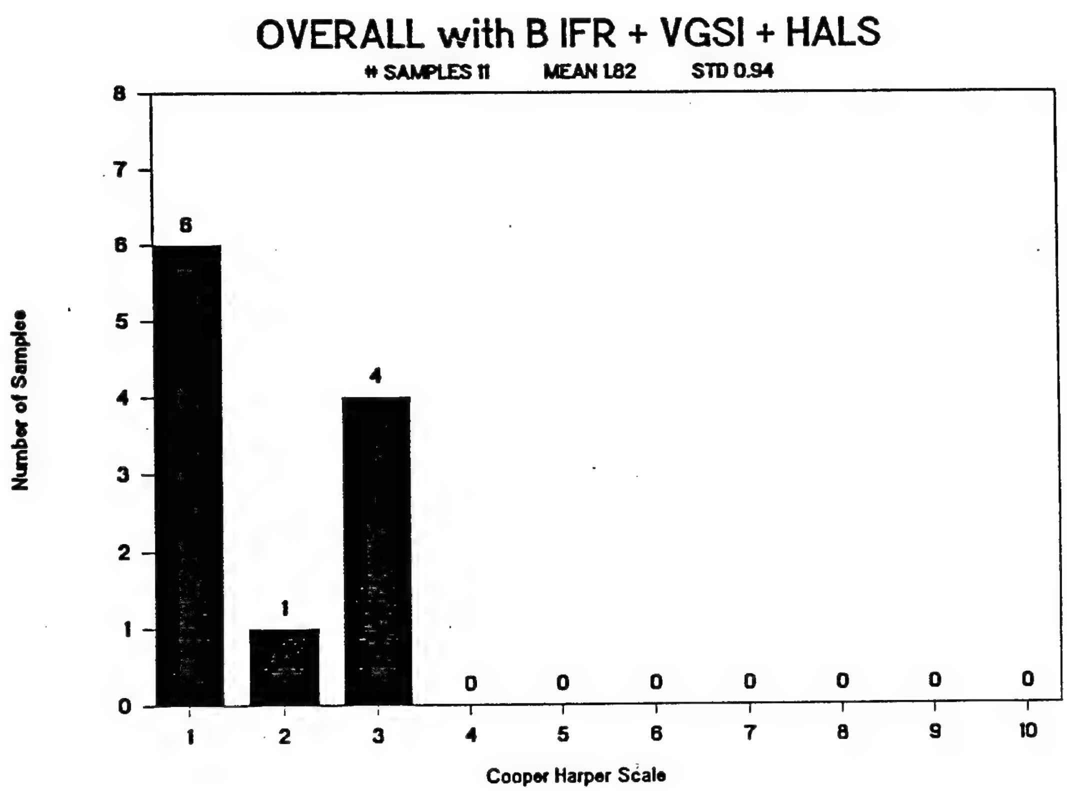


FIGURE 5. OVERALL RATING HISTOGRAM OF PILOT RESPONSE (SHEET 2 OF 2)

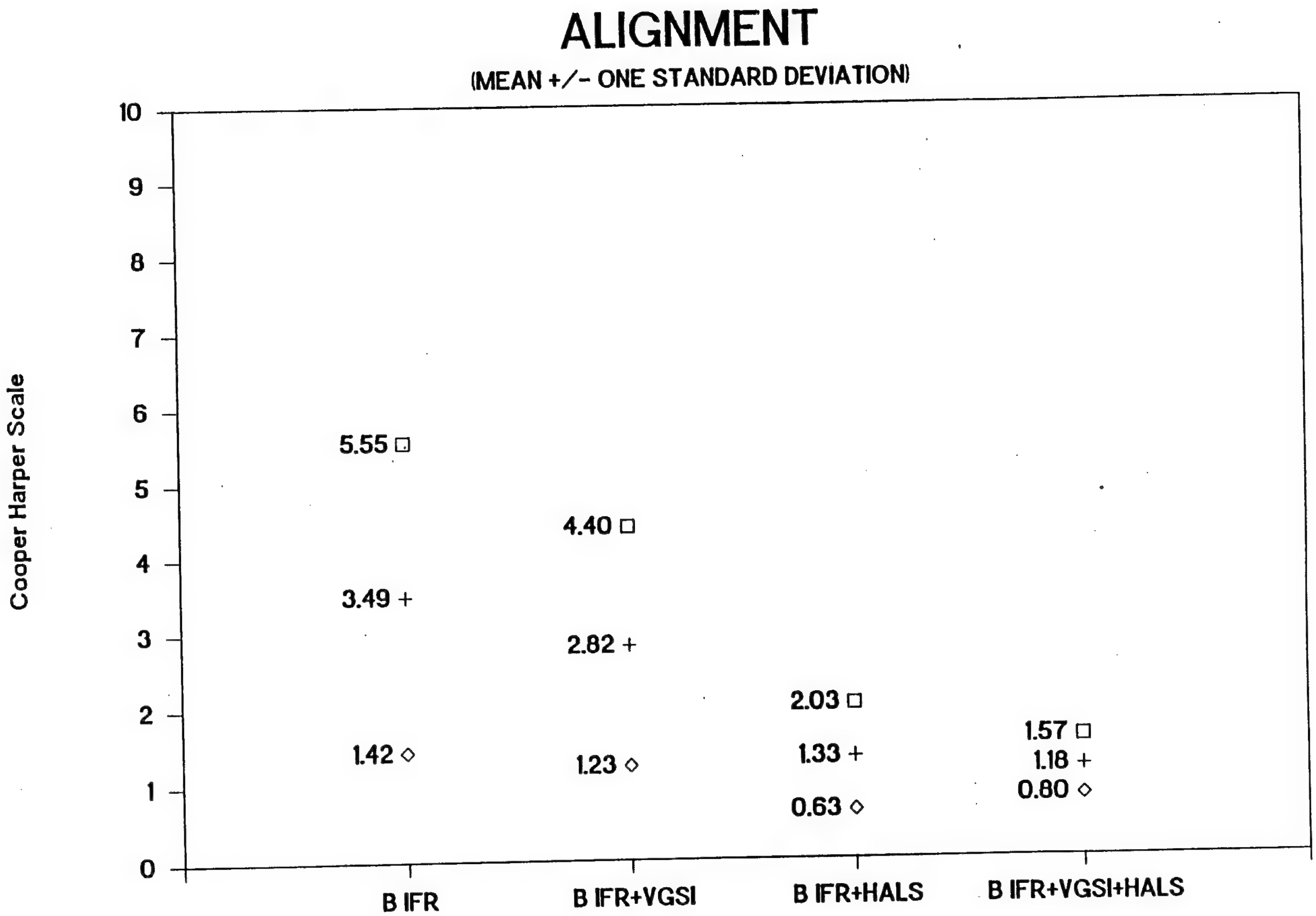
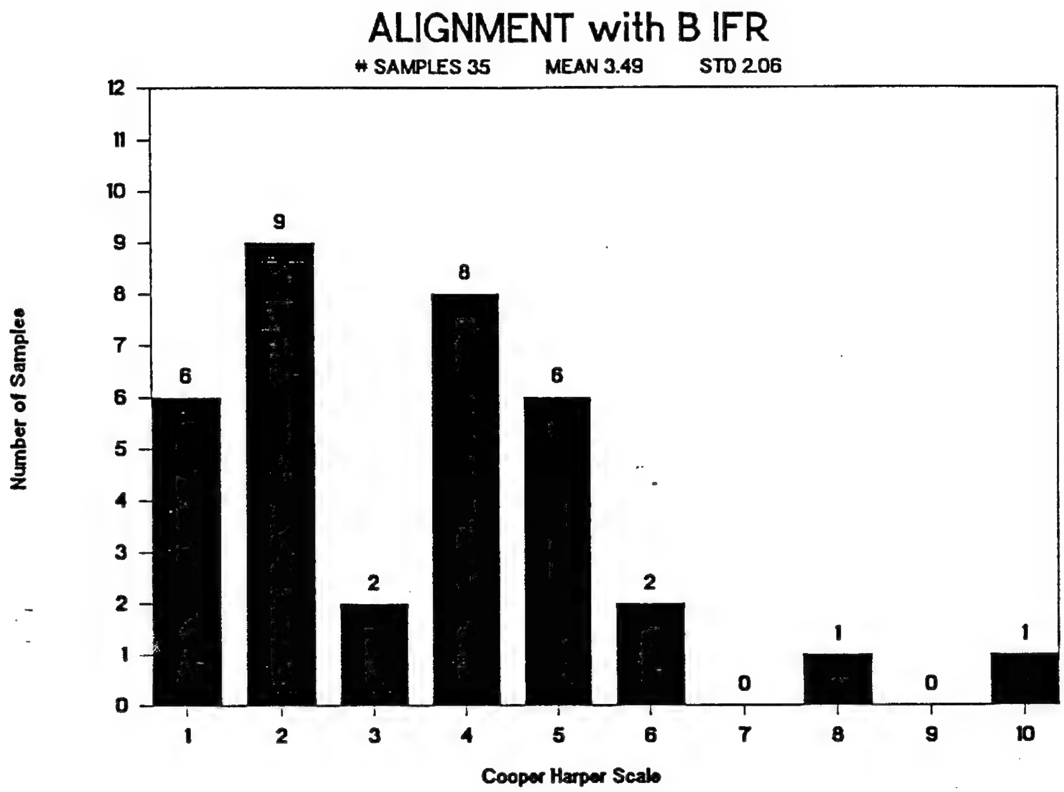


FIGURE 6. ALIGNMENT RATING PILOT REPSONSE



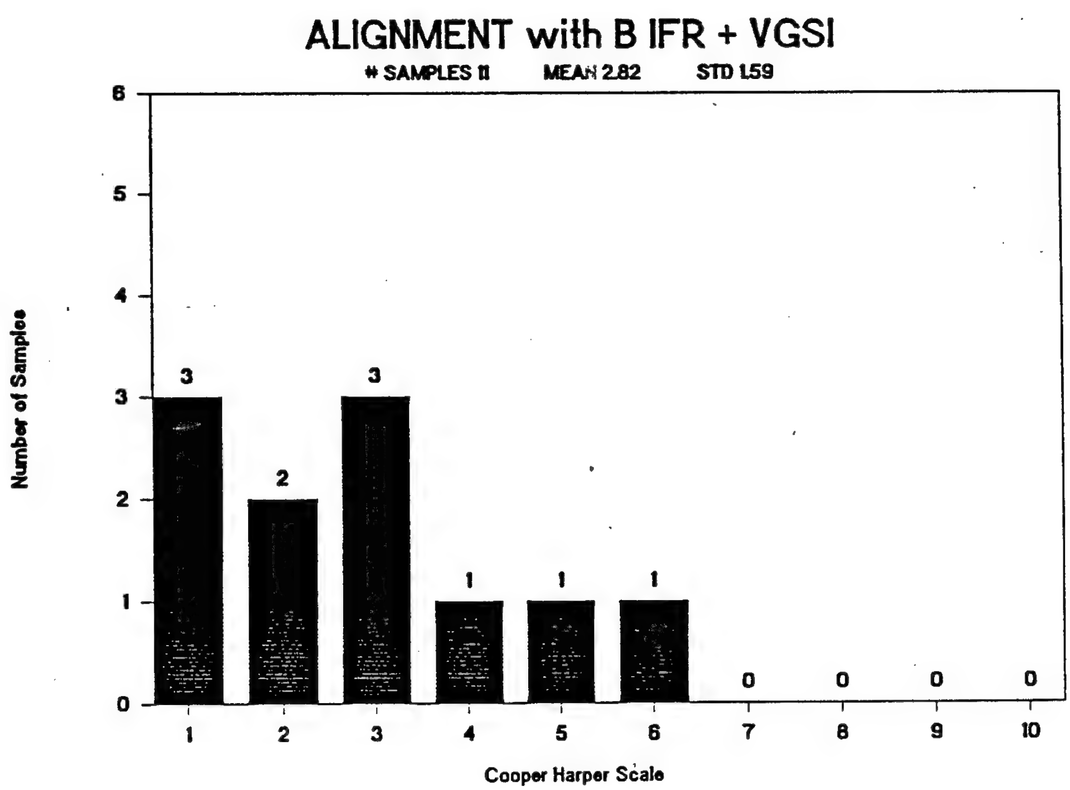
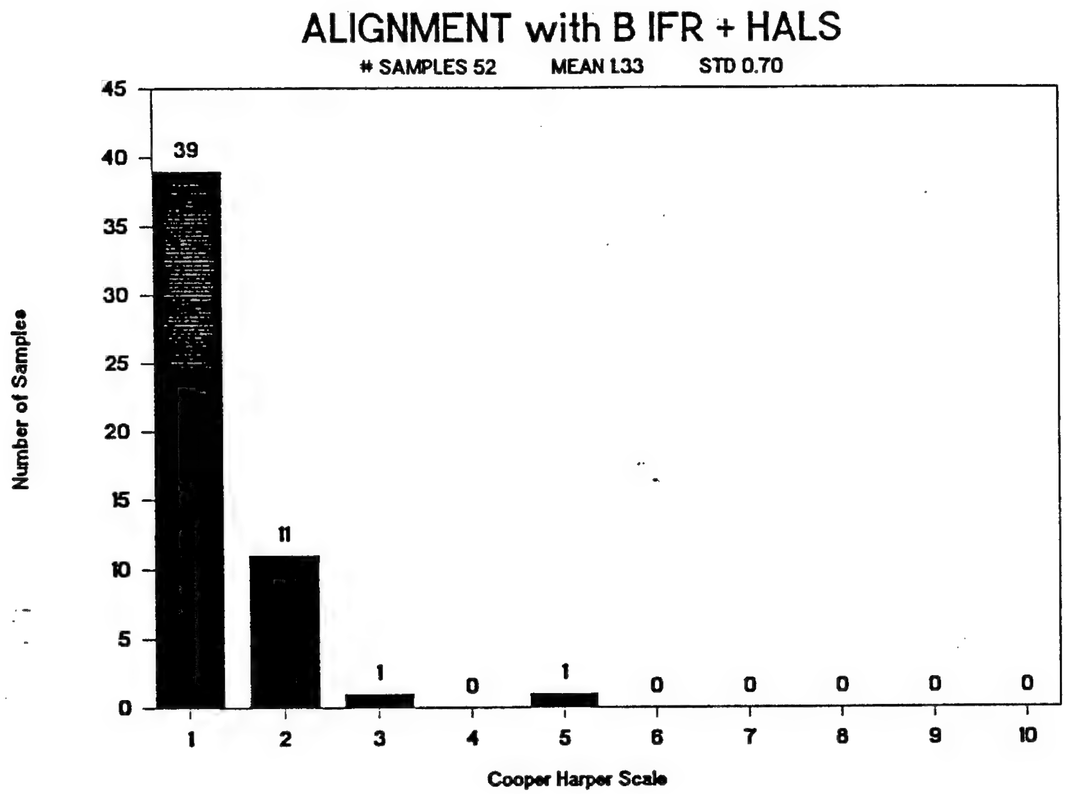


FIGURE 7. ALIGNMENT RATING HISTOGRAM OF PILOT RESPONSE (SHEET 1 OF 2)



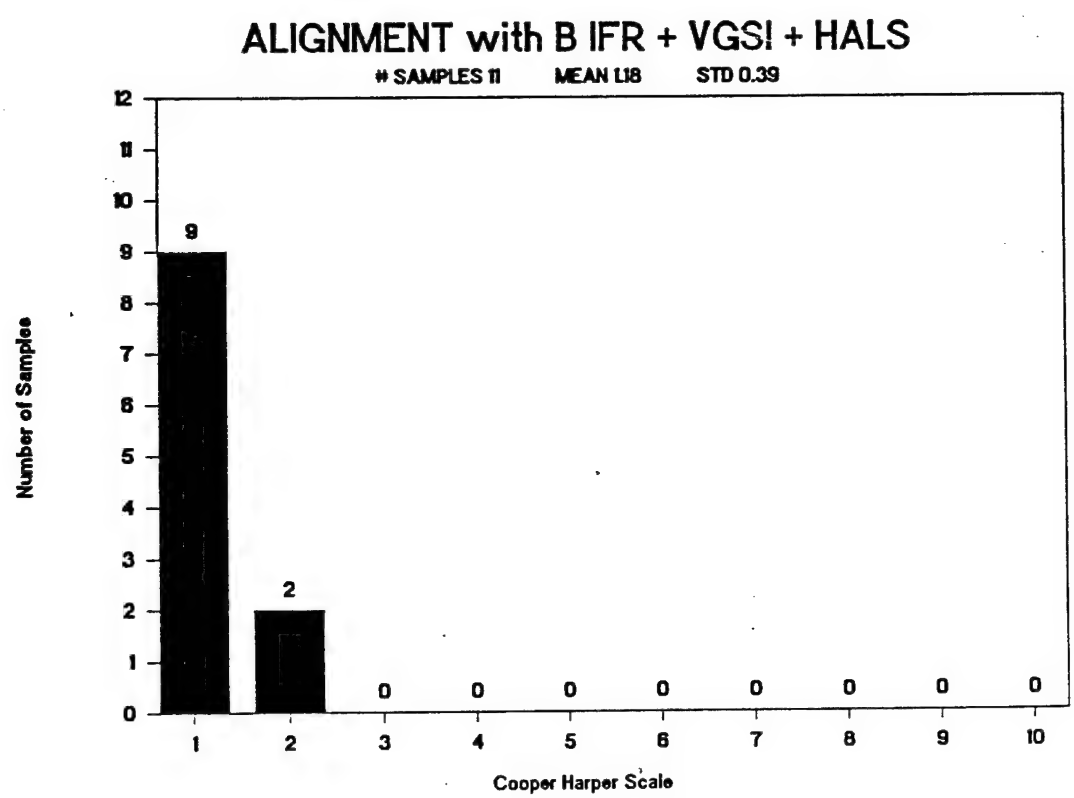


FIGURE 7. ALIGNMENT RATING HISTOGRAM OF PILOT REPSONSE (SHEET 2 OF 2)

DECELERATION RATING. A primary objective of the tests were to determine the ability of pilots to visually acquire the heliport and complete the landing following breakout into visual conditions at DH. The third question asked was, "Did the system displayed provide visual cues for determining rate of closure and/or deceleration during the visual portion of the approach?" The mean pilot responses +/- one standard deviation are presented in figure 8. This characteristic of the lighting system had a poor rating across all test conditions. The mean pilot responses for all test conditions, except when the Basic IFR Lighting System was augmented with both the HALS and VGSI, indicated that the pilots felt deceleration cuing was only sufficient to support rare use of the lighting system.

Only 15 percent of the pilot responses indicated that deceleration cuing with the Basic IFR System was sufficient for routine use. The fact is present when one views the histograms in figure 9. As can be seen in figure 9, even with HALS augmentation, nearly 35 percent of the pilot responses indicate from a deceleration cuing view point they would rarely or never use the system. Only when both HALS and VGSI are added to the Basic IFR System did a significant percentage of the responses indicate that the deceleration cuing aspect of the lighting system was adequate for routine use.

Several different performance measures to more fully characterize the deceleration issue were analyzed. The results of this analysis are discussed below.

WORKLOAD RATING. In order to obtain measures of perceived workload, subject pilots were asked to rate the workload associated with each test condition. Following each approach the subject was asked, "How would you rate your workload during the visual portion of the approach?" The mean pilot responses and +/- one standard deviation are depicted in figure 10. When HALS was available the mean pilot response indicated the workload was acceptable for routine use of the system. The histograms of the responses to the workload question for the various test conditions are depicted in figure 11. With only the Basic IFR System available, more than 55 percent of the responses indicated that the workload associated with the test condition would result in the pilots rarely or never using the system. When the Basic IFR System was augmented with both a HALS and VGSI, more than 80 percent of the responses suggest that the workload was low enough to routinely use the system.

CONTROLLABILITY RATING. The final question, which required a subjective pilot response following each approach, was designed to detect any aircraft related issues which might be biasing subject pilot opinion of the light systems being evaluated. The question asked was, "How would you rate aircraft controllability during the visual segment of the approach?" Figure 12 indicates very little difference concerning aircraft control for each of the systems tested. Regardless of the lighting system being used, aircraft controllability was sufficient to routinely use the system being tested. The histograms presented in figure 13 also indicate the pilots expressed little difficulty with aircraft controllability. The results of the response to this question strongly indicate workload and deceleration problems that appear when HALS is not present are not a manifestation of aircraft controllability.

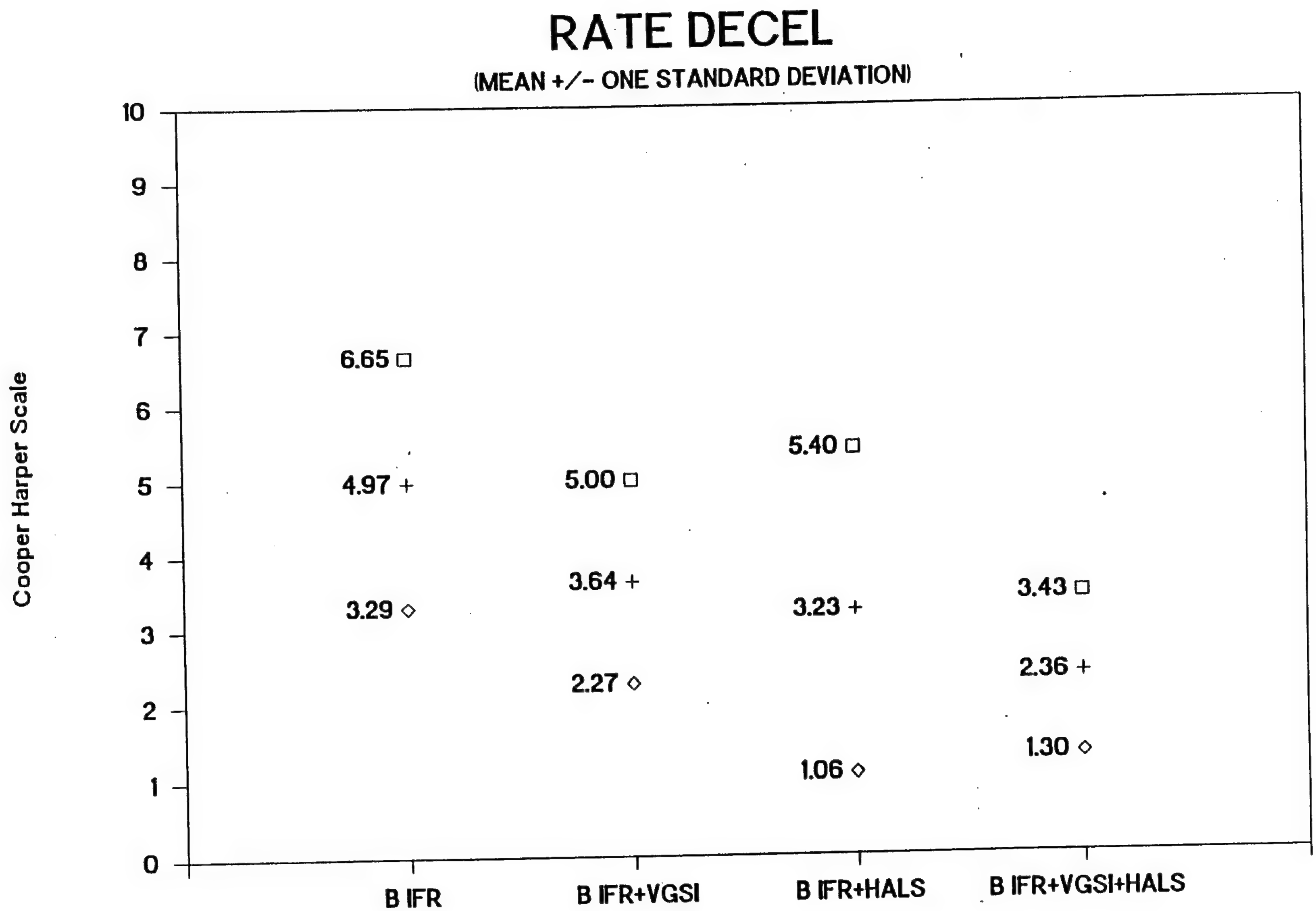
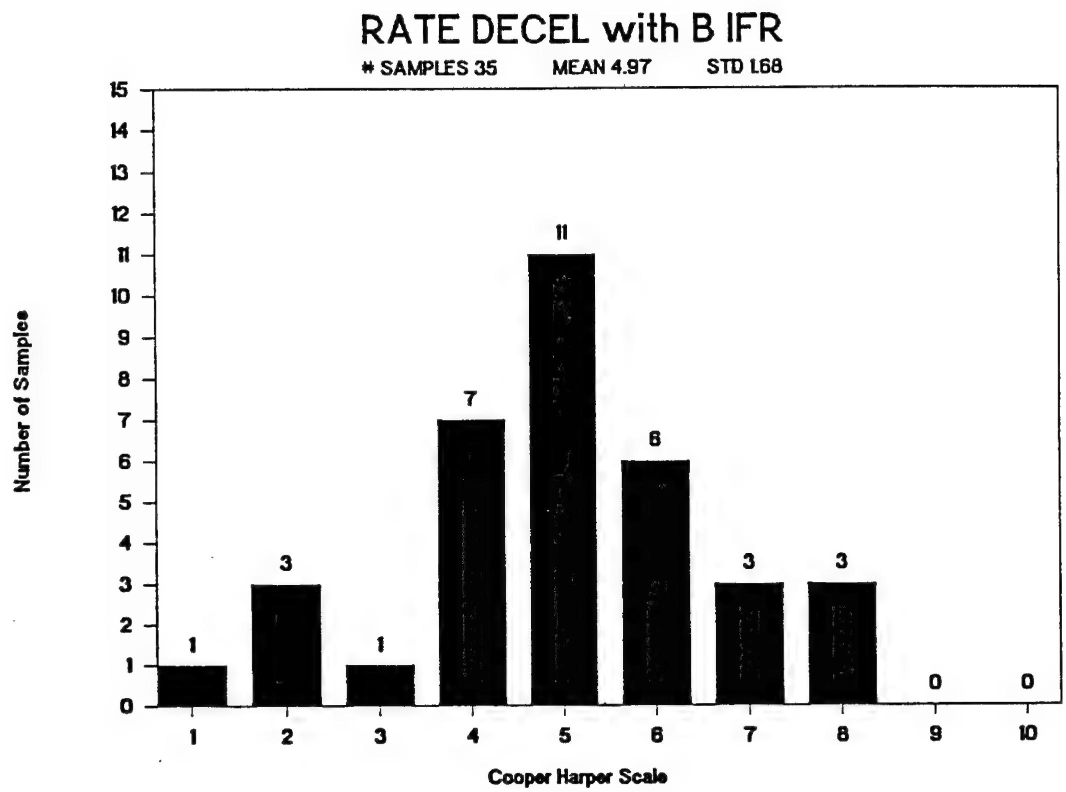


FIGURE 8. DECELERATION RATING PILOT RESPONSE



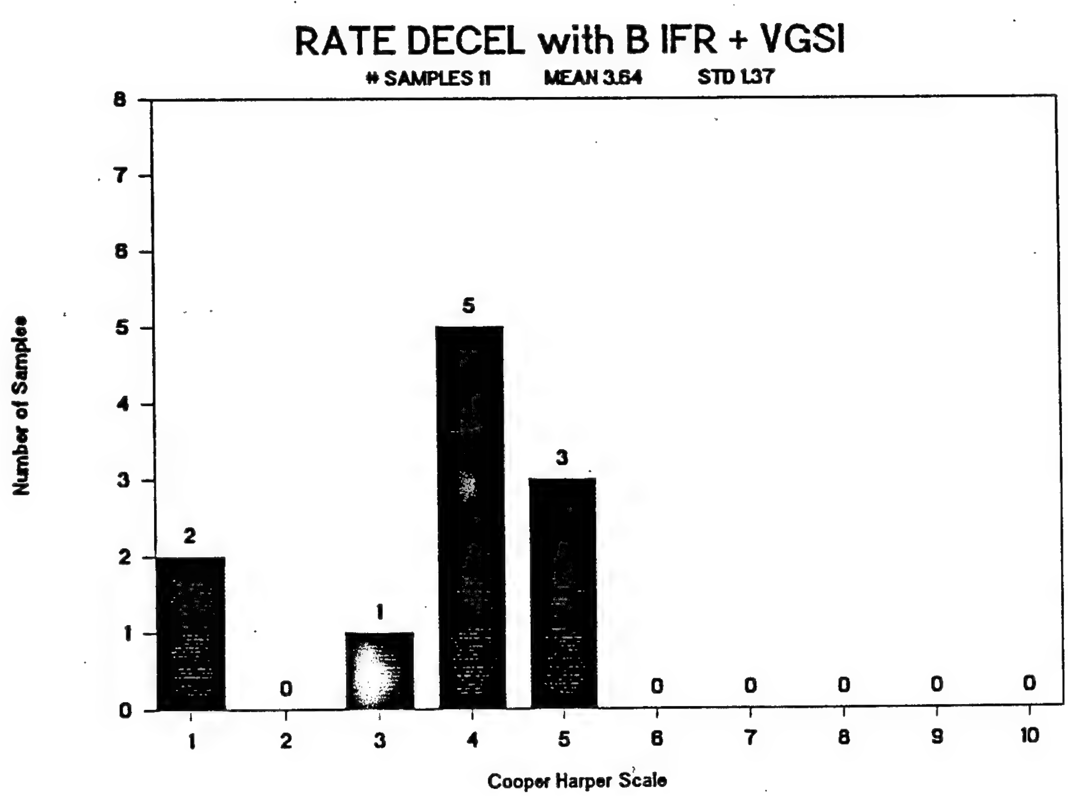
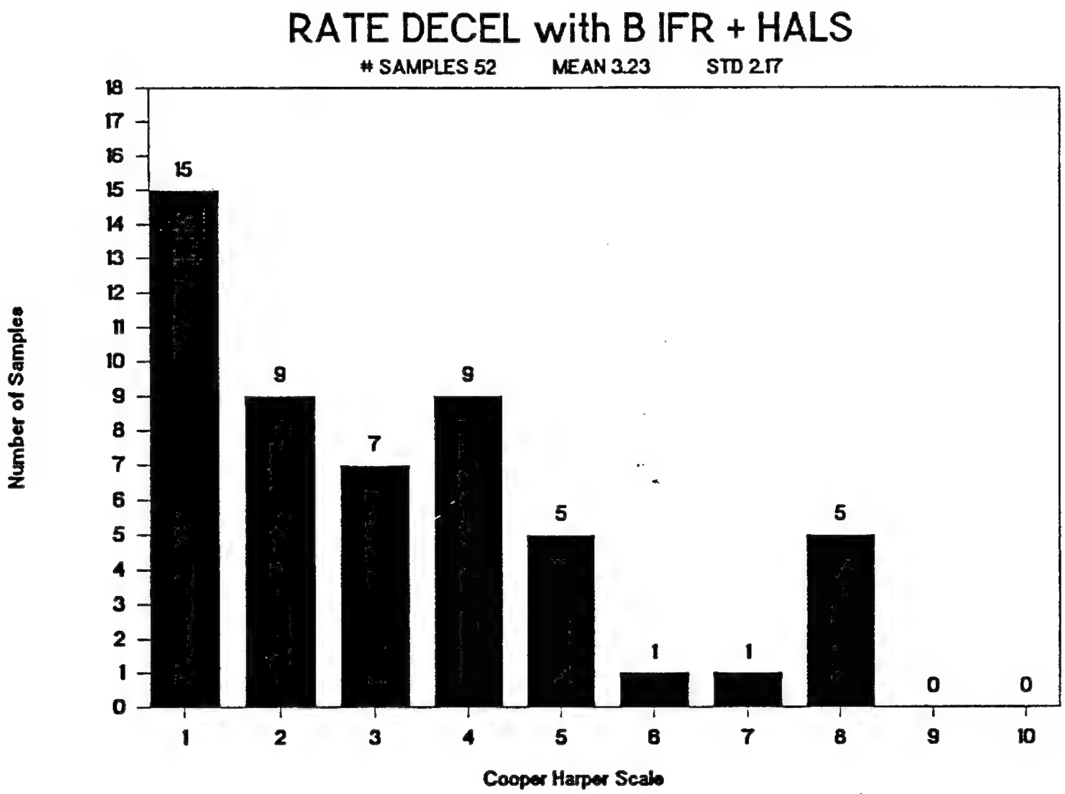


FIGURE 9. DECELERATION RATING HISTOGRAM OF PILOT RESPONSE (SHEET 1 OF 2)



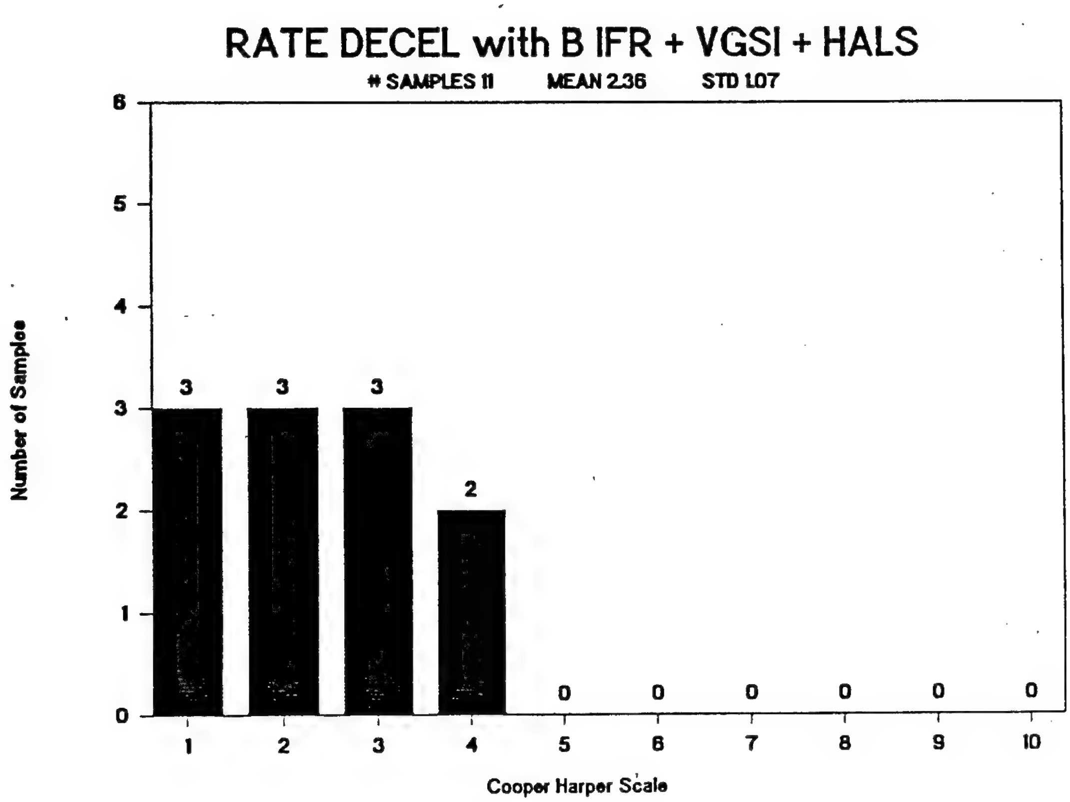


FIGURE 9. DECELERATION RATING HISTOGRAM OF PILOT RESPONSE (SHEET 2 OF 2)

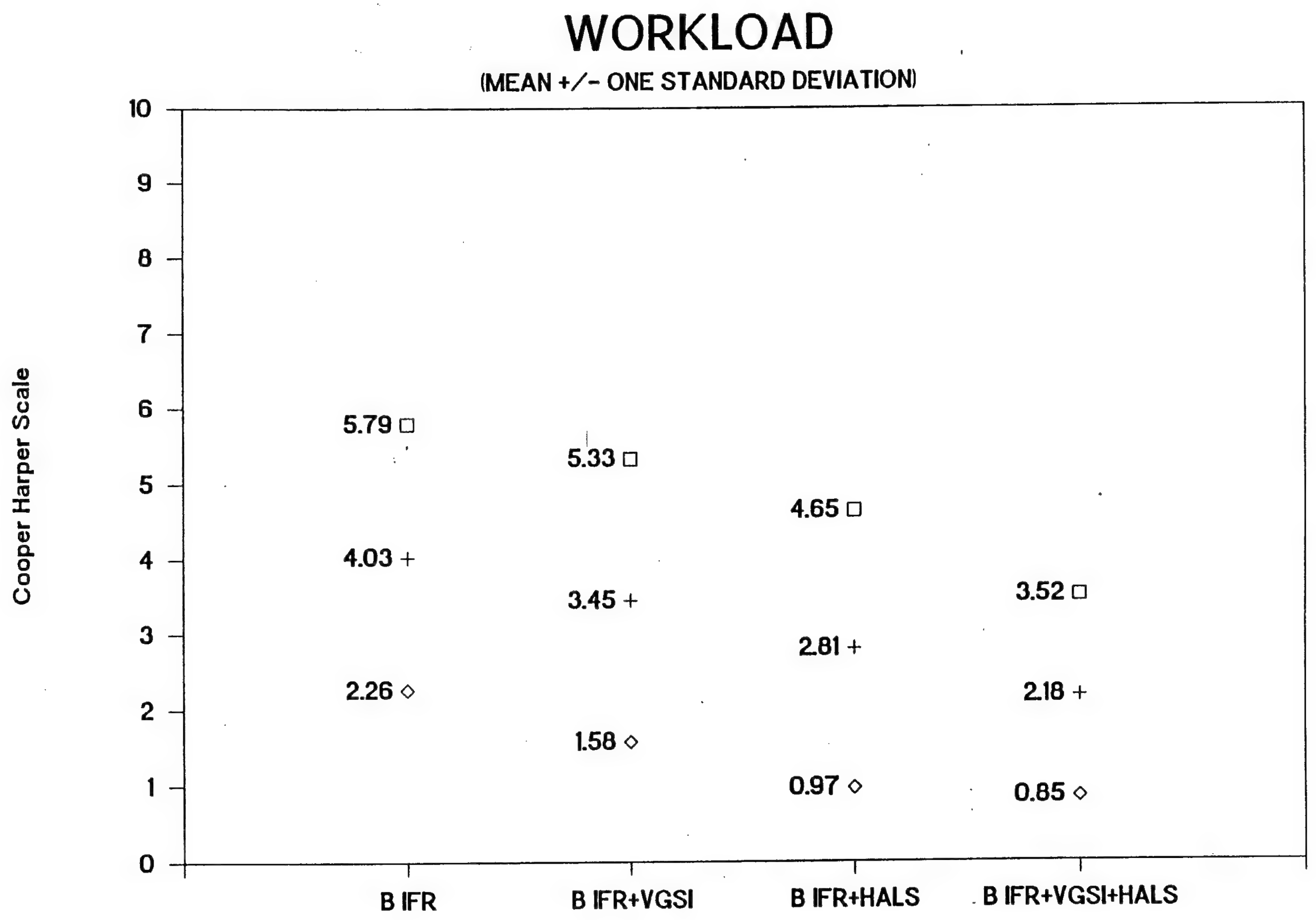
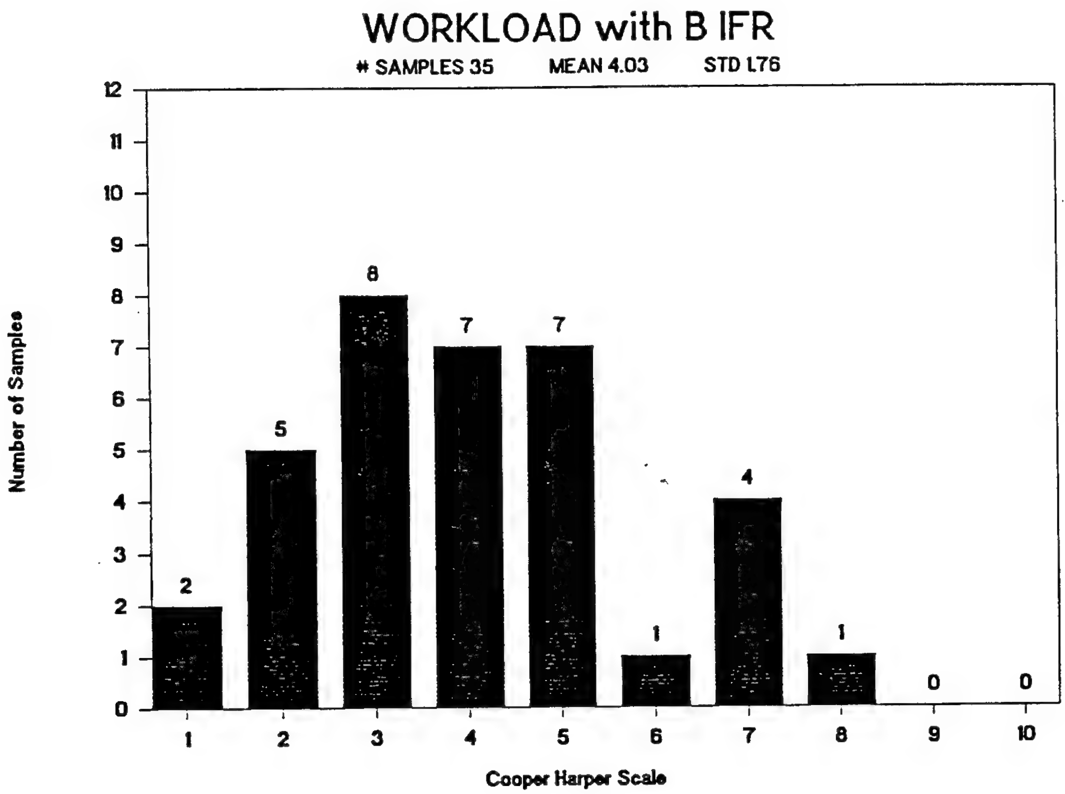


FIGURE 10. WORKLOAD RATING PILOT RESPONSE



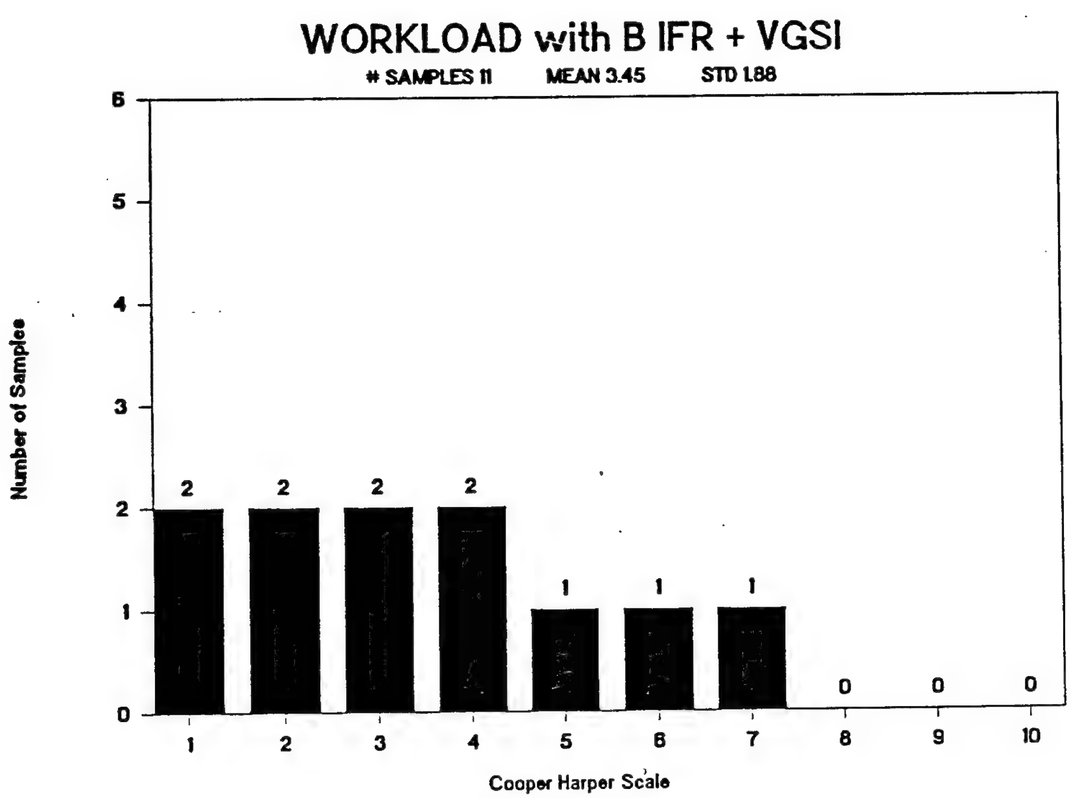
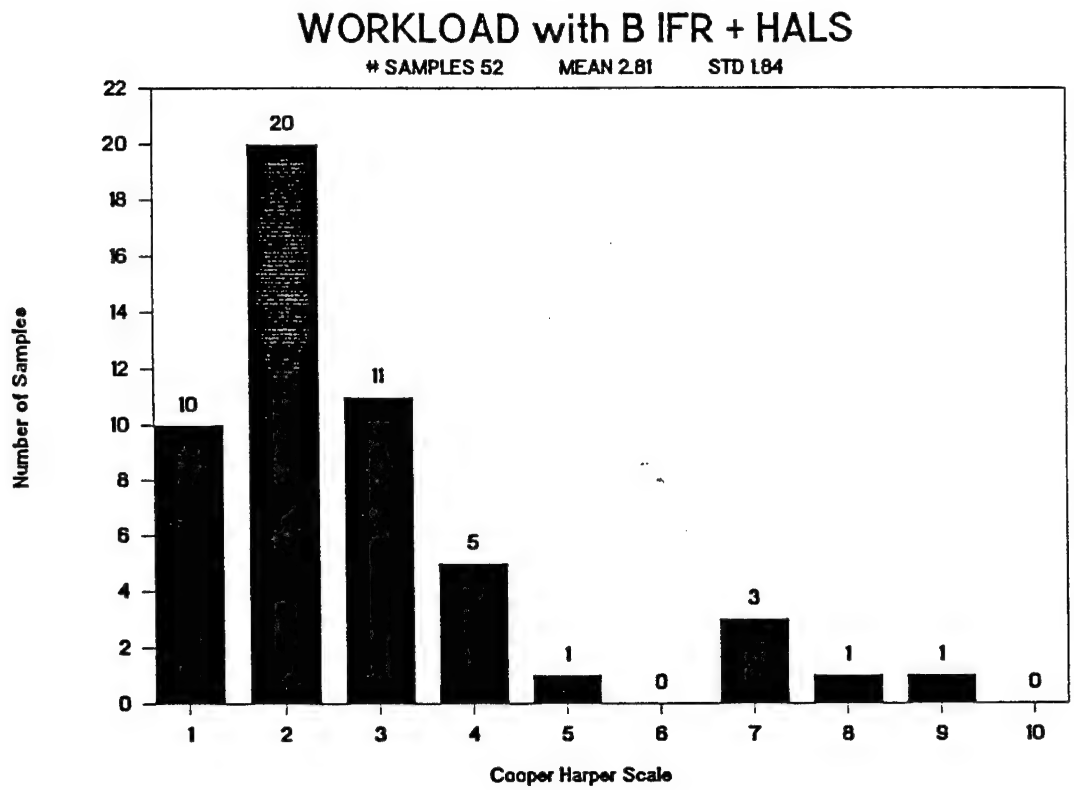


FIGURE 11. WORKLOAD RATING HISTOGRAM OF PILOT RESPONSE (SHEET 1 OF 2)



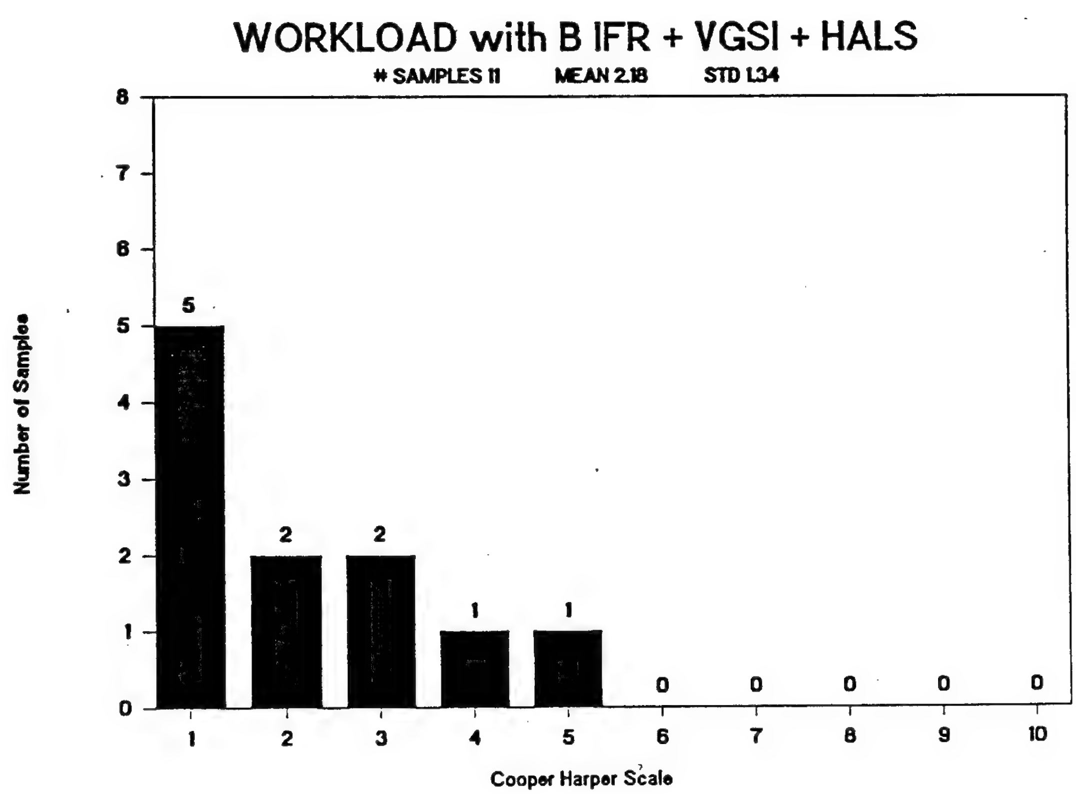


FIGURE 11. WORKLOAD RATING HISTOGRAM OF PILOT RESPONSE (SHEET 2 OF 2)

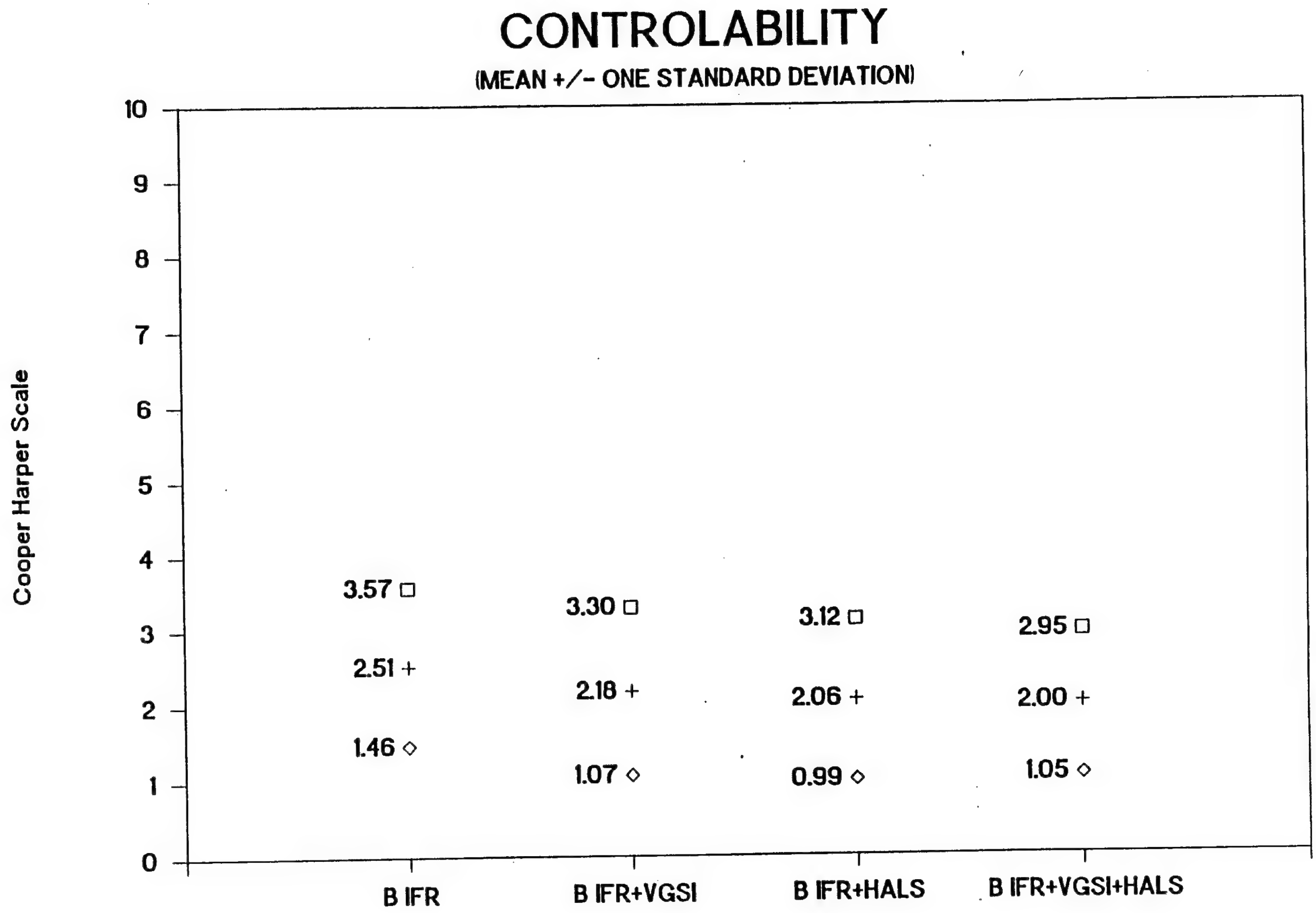
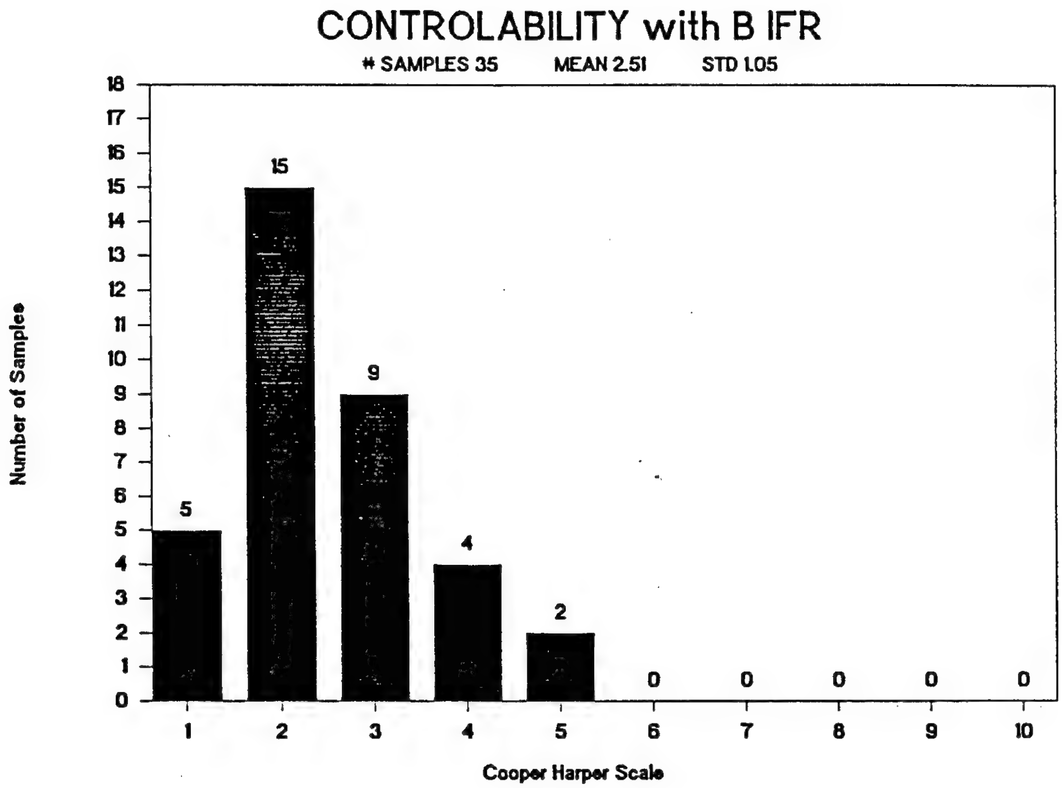


FIGURE 12. CONTROLLABILITY RATING PILOT RESPONSE



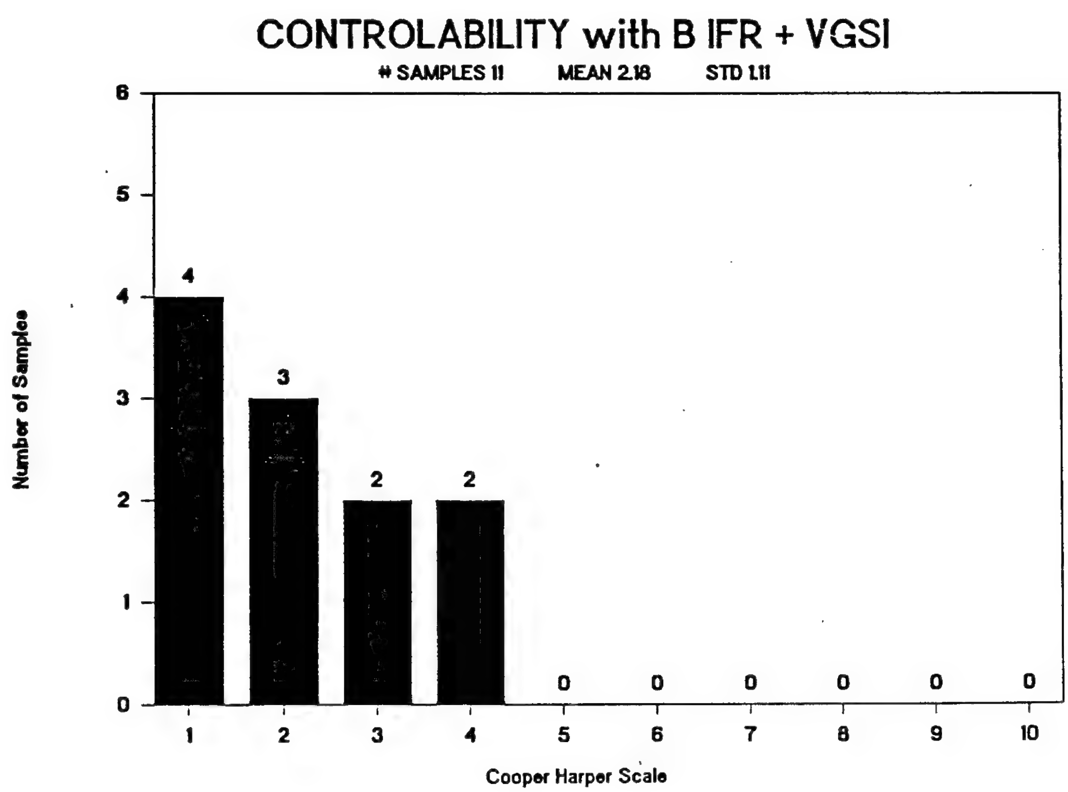
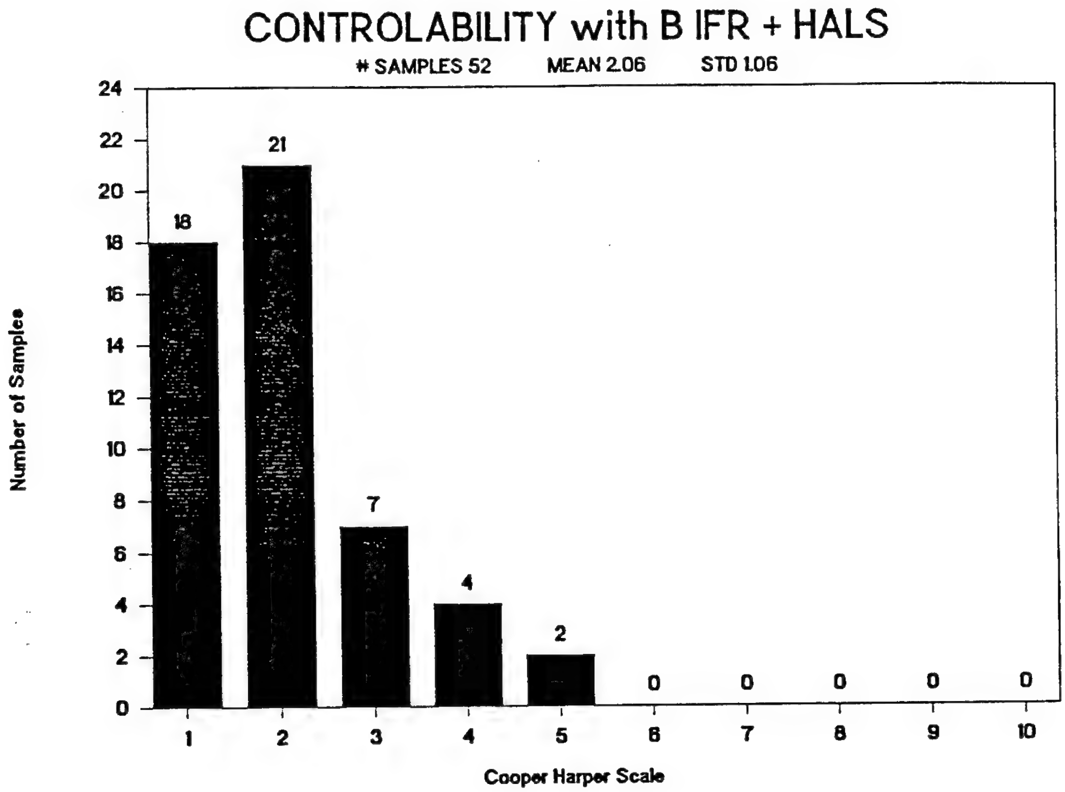


FIGURE 13. CONTROLLABILITY RATING HISTOGRAM OF PILOT RESPONSE (SHEET 1 OF 2)



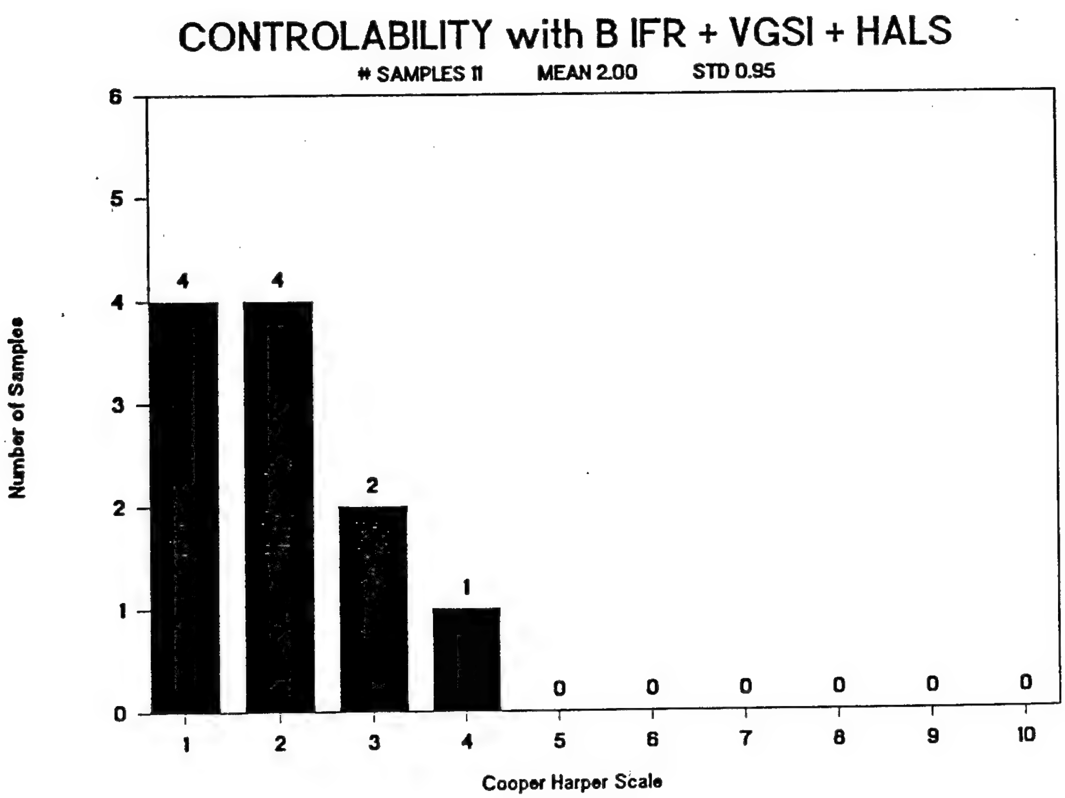


FIGURE 13. CONTROLLABILITY RATING HISTOGRAM OF PILOT RESPONSE (SHEET 2 OF 2)

POST-FLIGHT QUESTIONNAIRE ANALYSIS.

Following completion of the test flights each subject pilot was asked to complete a post-flight questionnaire. One question asked was, " Do you feel the HALS is required or essential as an addition to the Basic IFR Lighting System under the following MLS approach angle operations?" The responses of the seven subject pilots are presented in table 6.

TABLE 6. POST-FLIGHT QUESTIONNAIRE RESPONSES

Approach Angle	HALS Required	HALS Not Required
3.0	6	1
4.5	5	2
6.0	5	2

All subject pilots made the comment that some sort of visual vertical guidance aid for use during the visual segment of the approach is required. All subjects felt the VGSI when available substantially reduced their workload.

Two pilots with the highest amount of helicopter instrument flight time stated that the deceleration during the visual portion of the approach to a heliport is considerably more difficult when a precision approach is flown to DH than when a nonprecision approach is flown to an minimum descent altitude (MDA). They felt the difficulty arises because the pilot must maintain fairly precise vertical tracking with the precision approach while decelerating. Instrument scan from inside the cockpit to the heliport and visual guidance outside the cockpit transitions are more difficult for precision approaches due to the precise vertical tracking requirement. However, the nonprecision maneuver does not require the same vertical track precision and the deceleration can be accomplished more easily with aircraft in level flight.

PILOT PERFORMANCE.

Several aspects of pilot performance were investigated. These measures of pilot performance were obtained through use of the range tracking facilities and/or on-board data collection equipment. The data collection portion of each approach began when the aircraft passed DH or when the pilot stated he had the heliport lights in sight, which ever occurred first. The data collection period ended when the aircraft first descended below 50 feet radar altitude or when it crossed the leading edge of the heliport on its approach. Data recording rates were 5 hertz (Hz) for aircraft recorded parameters and 10 Hz for range tracked parameters.

LATERAL TRACKING PERFORMANCE. The standard deviations of the lateral flight technical error were computed for each approach. Since wind conditions for a given flight can impact lateral tracking performance, table 7 presents the standard deviations of the lateral flight technical errors for each approach.

TABLE 7. LATERAL FLIGHT TECHNICAL ERROR (DEGREES X 0.01)

Flt No.	Elevation Angle	Centerline Basic	Approaches Basic+HALS	Offset Basic	Approaches Basic+HALS
1	3.0	50	34	150	-
	4.5	40	26	-	190
	6.0	64	116*	-	-
2	3.0	19	86*	27	101
	4.5	-	62	230	201
	6.0	-	21	273	159
3	3.0	41	20	185	-
	4.5	-	43	179	-
	6.0	-	30	103	138*
4	3.0	25	39*	31	114
	4.5	-	21	189	237*
	6.0	-	56	30	128*
5	3.0	71	100*	166	104
	4.5	-	48	119	180
	6.0	-	104	55	44
6	3.0	58	28	107	109*
	4.5	-	64	78	190*
	6.0	-	25	176	9
7	3.0	39	16	109	138*
	4.5	-	13	75	179*
	6.0	-	16	122	71
8	3.0	17	38*	18	141*
	4.5	-	40	151	80
	6.0	-	39	198	129
9	3.0	80	13	131	119
	4.5	-	12	114	176*
	6.0	-	26	192	114
10	3.0	45	18	188	117
	4.5	-	27	87	158*
	6.0	-	26	56	107*
11	3.0	67	57	125	98
	4.5	-	39	125	119
	6.0	-	-	153	161*
12	3.0	18	29*	135	37
	4.5	-	38	24	179*
	6.0	-	21	88	107*

*BASIC + HALS exceeds basic standard deviation for similar conditions.

In table 7 the lateral performance improvements with the addition of HALS can be seen. For the centerline approaches, on 8 of 14 occasions the lateral flight technical error (FTE) with HALS was smaller. Improvements in the pilot's lateral tracking performance for offset approaches was not as pronounced when HALS was available.

For each approach a plot of lateral position versus range was prepared. An example of a plot is presented in figure 14. This is an example of an offset approach. These plots were used to identify if on an offset approach the pilot attempted to maneuver to the centerline when he visually acquired the heliport. A total of 43 offset approaches were flown during the tests. On all but two of the approaches the pilot attempted to maneuver to the approach centerline once he visually acquired the heliport. The accumulated lateral position plots can be reviewed in appendix D.

Table 8 depicts the maximum amount of lateral overshoot in feet which occurred when the pilot attempted to correct to the centerline on offset approaches. The negative mean value associated with the Basic IFR only lighting condition indicates that the pilots, on the average, never got to the approach centerline. The considerably larger standard deviation for this lighting condition also indicates poor pilot performance in correcting to the centerline when HALS was not available.

TABLE 8. MAXIMUM AZIMUTH OVERSHOOTS (OFFSET APPROACHES)

Test Condition	Mean Overshoot Feet	Std Dev Feet	N
Basic IFR	-15.89	38	24
Basic IFR + HALS	8.74	7	19

VERTICAL TRACKING PERFORMANCE. Pilot performance in the vertical domain was also investigated. For each approach a plot similar to figure 15 was prepared. This plot presented range rate and elevation error versus range. These accumulated plots can be reviewed in appendix E. For each approach the maximum vertical error above and below the reference glide slope was determined. These errors are expressed in feet. The location in range from the heliport for each of these errors was also determined. The mean and standard deviation for each of the errors are presented in table 9.

The addition of HALS reduced the peak overarc errors by 15 percent. When HALS was available the peak errors tended to occur earlier in the approach, indicating considerably smaller peak overarc angular errors. Although the pilots rated the addition of the VGSI as the best lighting configuration, no improvement in their vertical performance can be detected. For both peak overarc and underarc conditions, the errors increased with the addition of the VGSI. The fact that they rated the addition of VGSI as the best condition despite their performance, can be explained by the added confidence the VGSI provided in terms of vertical position. The pilots tended to relax when they had an on glidepath indication. A narrower on glidepath window would increase pilot vertical performance without a significant increase in workload.

RUN # 3
7/7/88 UH1 HALS 3.0 DEGREE FL 200 FT DH 5 DEGREE R AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405

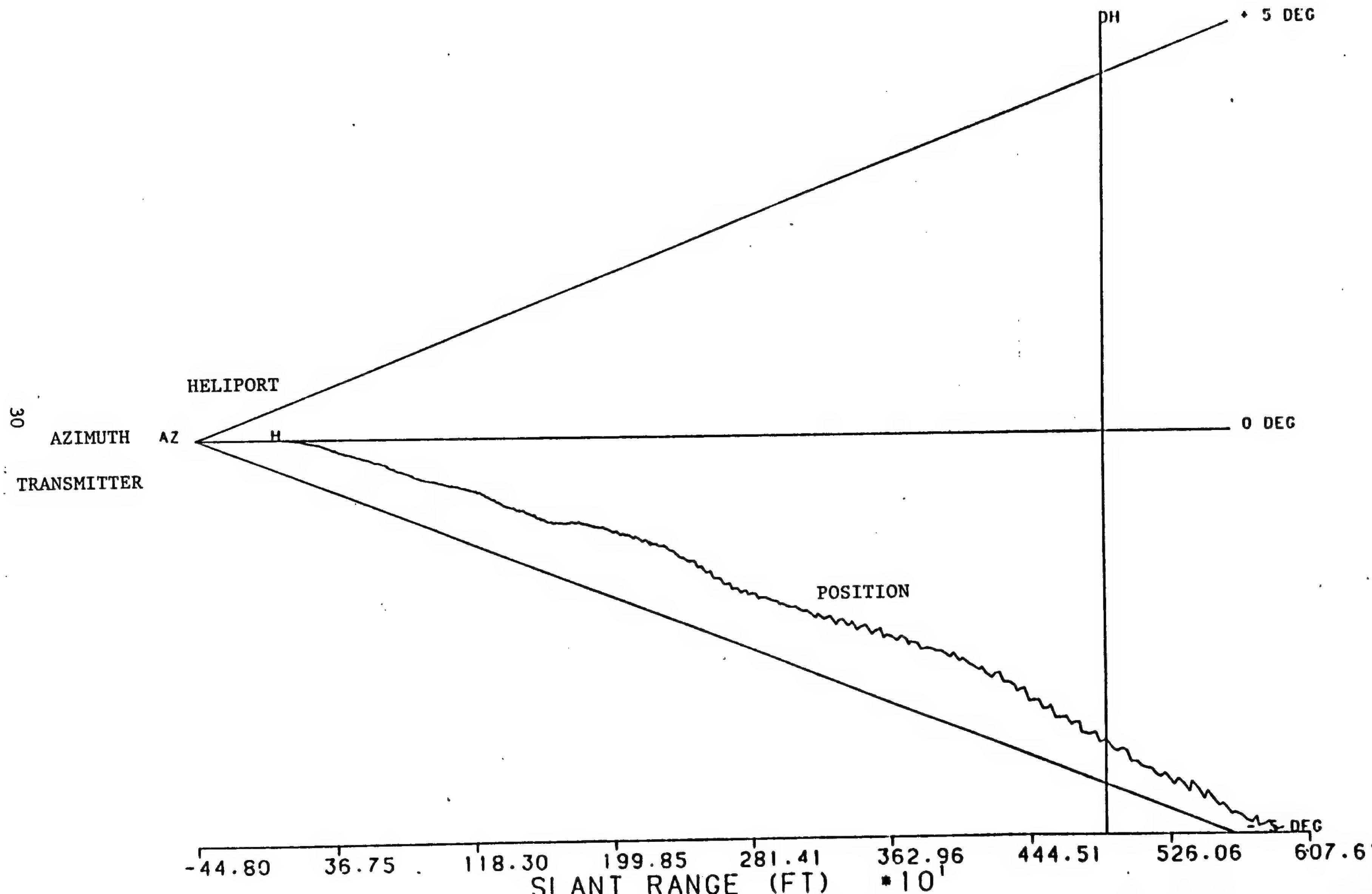


FIGURE 14. LATERAL POSITION VS RANGE PLOT

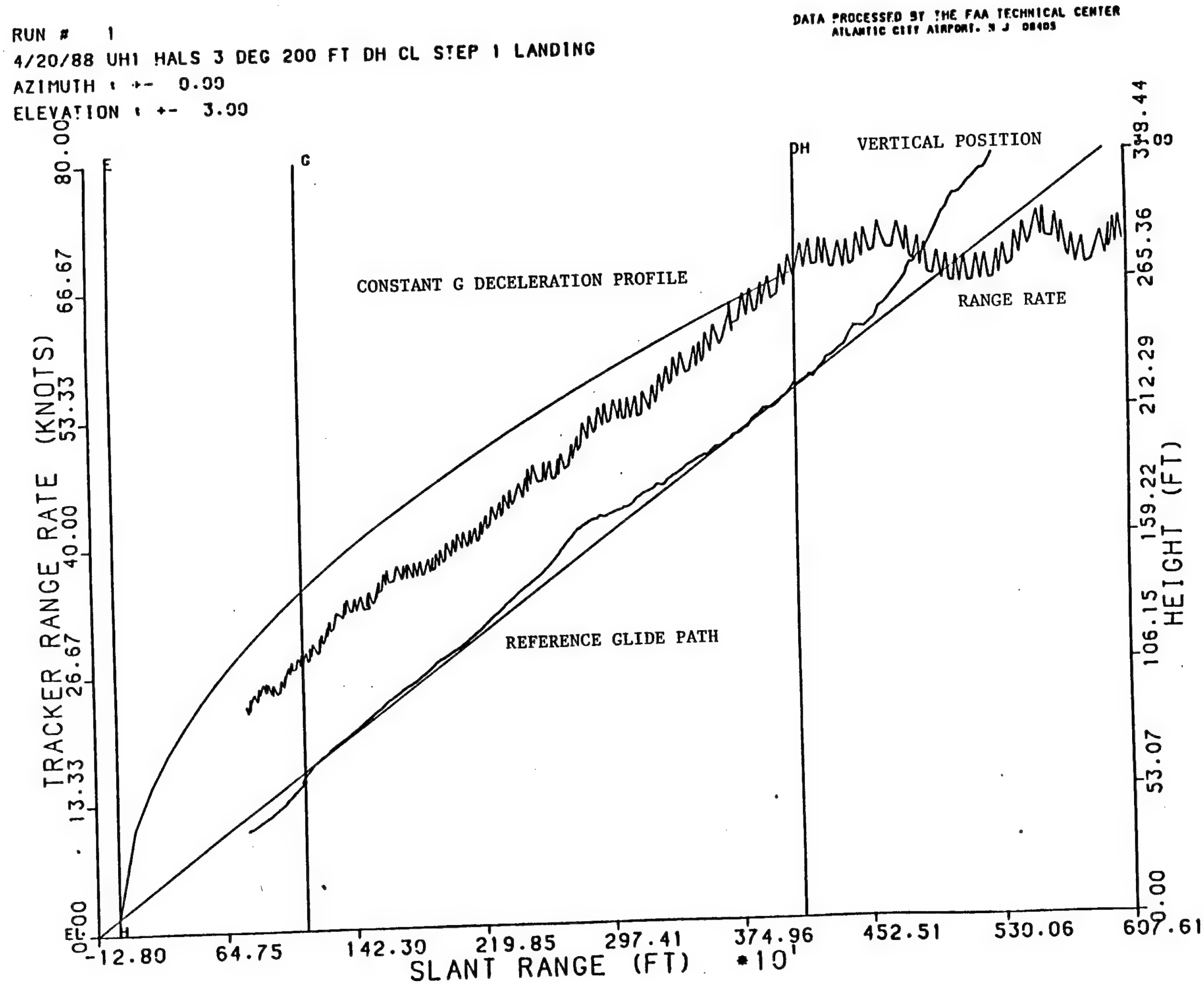


FIGURE 15. VERTICAL POSITION VS RANGE PLOT

TABLE 9. ELEVATION ERRORS (FEET)

Statistic	Test Condition	Mean Feet	Std Dev Feet	Number
Maximum Overarc	Basic IFR	79	34	35
	Basic IFR + VGSI	97	57	11
	Basic IFR + HALS	69	33	52
	IFR + HALS + VGSI	74	28	11
Range to Max Overarc	Basic IFR	1975	972	35
	Basic IFR + VGSI	1763	769	11
	Basic IFR + HALS	2085	1099	52
	IFR + HALS + VGSI	1521	536	11
Maximum Underarc	Basic IFR	5	17	35
	Basic IFR + VGSI	17	19	11
	Basic IFR + HALS	-6	36	52
	IFR + HALS + VGSI	14	30	11
Range to Max Overarc	Basic IFR	2673	1771	35
	Basic IFR + VGSI	1292	680	11
	Basic IFR + HALS	1866	1319	52
	IFR + HALS + VGSI	1223	561	11

Another point that should be made is the fact that the addition of HALS tended to eliminate underarc conditions. The mean peak underarc of -6 feet indicates a majority of the approaches displayed no underarc when HALS was available.

DECELERATION PERFORMANCE. The pilots stated the most difficult aspect of the visual segments of the precision approaches was the ability to decelerate and land at the heliport. Analysis was conducted to characterize deceleration performance with and without the HALS.

Figure 15 presented an example of vertical plot information which was obtained for each approach. The vertical position versus range is shown. In addition the nominal deceleration profile that would have resulted with a constant deceleration to landing for that approach is shown. Plotted against this nominal profile is the range rate for the approach. These accumulated plots are in appendix E. In general, when HALS was available the decelerations were smoother.

For each approach the location of the peak deceleration in G units was obtained. Table 10 presents the mean peak decelerations and the mean range to the location where the peak occurred for each test condition.

The mean peak decelerations with HALS was 25 percent smaller than the peaks observed with the Basic IFR System. The peak decelerations tended to occur earlier in the approach when HALS was available. The addition of the VGSI also tended to smooth the decelerations. When the VGSI alone was added to the Basic IFR System the peak deceleration values were reduced by more than 50 percent.

TABLE 10. PEAK DECELERATIONS AND LOCATIONS

Statistic	Test Condition	Mean (G's)	Std Dev (G's)	Number
Peak G's	Basic IFR	-0.31	0.26	35
	IFR + VGSI	-0.14	0.52	11
	IFR + HALS	-0.23	0.21	50
	IFR + HALs + VGSI	-0.18	0.11	11
Range to Peak G's	Basic IFR	1800	1025	35
	IFR + VGSI	887	598	11
	IFR + HALS	1899	1445	50
	IFR + HALS + VGSI	970	581	11

The locations where the peak decelerations occurred were reviewed for each separate approach to see if different test conditions resulted in a different pattern of the peak deceleration locations. These are presented in table 11. The lack of deceleration cuing without HALS resulted in two missed approaches. These are marked with an MA in table 11. Additionally, one peak deceleration location with the Basic System was -229 feet. In this case, the pilot flew 229 feet beyond the center of the heliport before reaching his peak deceleration. On only four ocassions during centerline approaches did the peak G location with the Basic System occur earlier in the approach than with HALS for a similar approach. The analysis of peak G location indicates when HALS was present, smoother decelerations were made and the peak deceleration occurred earlier in the approach. Two missed approaches occurred without HALS because the pilots could not decelerate sufficiently to land.

AIRCRAFT ATTITUDE CONTROL. Aircraft pitch and roll was recorded to determine if any significant differences resulted with the different light systems which were tested. The mean peak pitch values in degrees and the location where they occurred are presented in table 12.

Very little difference was detected in the peak pitch values. This results because the pilots are using near maximum pitch angles with which they still retain line of sight to the heliport. When the VGSI was present the peak pitch attitudes occurred considerably later in the approach. This probably indicates smoother pitch application when VGSI was present. It is important to point out that these pitch angles are associated with the Bell UH-1H helicopter. Other aircraft capabilities may not match these values.

The roll data were reviewed to determine the peak roll angles that occurred during the offset approaches. As shown in table 13 the peak roll angles with HALS was only one-third the peak roll angles without HALS. Again, this indicates the pilots could more easily smooth their roll inputs when HALS was present.

TABLE 11. PEAK DECELERATION RANGE IN FEET

Flight Number	Elevation Angle Degrees	Centerline Basic	Approaches HALS	Offset Basic	Approaches HALS
1	3.0	611	4162	856	4032
	4.5	819	3184	-	2804
	6.0	1090	1299	-	-
2	3.0	1893	1563	MA	1530
	4.5	-	2303	2424	-
	6.0	-	865	775	2990
3	3.0	1824	817	MA	-
	4.5	-	2511	2663	-
	6.0	-	718	1151	619
4	3.0	1584	2887	584	2030
	4.5	-	1037	662	3270
	6.0	-	1347	1410	657
5	3.0	920	262	3538	3548
	4.5	-	2562	1660	5085
	6.0	-	1232	-229	453
6	3.0	1433	2476	4025	2180
	4.5	-	652	2172	637
	6.0	-	640	364	624
7	3.0	2442	3462	1177	8222
	4.5	-	990	1157	1400
	6.0	-	806	1076	735
8	3.0	2128	3838	3767	2978
	4.5	-	-	1515	1407
	6.0	-	646	1197	1290
9	3.0	1203	1338	849	655
	4.5	-	1163	1529	1476
	6.0	-	1215	412	1853
10	3.0	606	1063	3459	3603
	4.5	-	1470	1691	794
	6.0	-	1351	1091	2086
11	3.0	502	1775	1152	1104
	4.5	-	1060	1697	2382
	6.0	-	-	538	1286
12	3.0	2177	1167	1965	4094
	4.5	-	3033	3863	1464
	6.0	-	470	1976	735

MA = Missed Approach

TABLE 12. PITCH ATTITUDE STATISTICS

Statistic	Test Condition	Mean (Deg)	Std Dev (Deg)	Number
Peak Pitch	Basic IFR	7.10	1.55	35
	IFR + VGSI	8.96	3.29	11
	IFR + HALS	7.12	2.27	51
	IFR + HALS + VGSI	7.97	2.91	11
		Feet	Feet	
Range to Peak Pitch	Basic IFR	1788	1204	35
	IFR + VGSI	1120	621	11
	IFR + HALS	1561	1032	51
	IFR + HALS + VGSI	893	556	11

TABLE 13. ROLL STATISTICS FOR OFFSET APPROACHES

Test Condition	Mean (Deg)	Std Dev (Deg)	Number
Basic IFR	3.31	4.42	24
Basic IFR + HALS	1.19	5.18	19

CONCLUSIONS

Several conclusions can be made based on the subjective and objective data analyses of the Heliport Approach Lighting System (HALS) test results. The HALS can support the precision approaches to heliports when the approach minima contained in the draft Heliport Terminal Instrument Procedures (TERPS) document are used. When HALS was used all approaches were successfully completed even when guidance was significantly displayed from the nominal approach centerline Decision Height (DH).

All subject pilots rated the approach light system characteristics significantly better when the visual glideslope indicator (VGSI) was available. Although there was not a detectable improvement in pilot vertical tracking performance with the addition of the VGSI, all subjects rated the workload lower and the deceleration guidance better when the VGSI was available. The VGSI was not optimally tuned to enhance pilot performance for these tests.

On two occasions the subject pilot was unable to complete the approaches to the heliport resulting in missed approaches. In both cases the HALS was not available for the approach. The critical nature of the missed approaches cannot be overemphasized. The pilot elected to miss well inside DH, resulting in a flight path which placed the aircraft well below the 20:1 missed approach surface for a significant period of time.

The mean pilot responses for the deceleration cuing and workload characteristics (-3.6) indicates pilots would rarely use a system if HALS were not available. Analysis of subjective comments and performance data indicates that HALS provides

more benefit than just extending the range to ground contact. These benefits could not be quantified. However, decelerations were more constant and were initiated sooner when HALS was available.

A question which must be addressed is what are the appropriate minima when HALS is not available. This test was not structured to answer that question. Testing to address that issue requires that the approach minima be a test variable rather than a fixed condition as it was in this test.

The benefits from a vertical guidance aid such as the VGSI must be investigated more fully. This test was not designed to optimize the performance gains that are possible when a lighting aid is present to provide vertical guidance.

RECOMMENDATIONS

Based on the analysis of test results the following recommendations are made.

1. Release the heliport Microwave Landing System (MLS) Terminal Instrument Procedures (TERPS) with minima as published if a Heliport Approach Light System (HALS) similar to the one evaluated in these tests is available. Minima without HALS should be very conservative (i.e., 400 feet and 1 mile or greater) until further testing can be accomplished.

2. Design and conduct a series of tests to determine the appropriate approach minima for precision instrument approaches to heliports when an approach light system is not available. Also, testing to identify optimal visual glideslope indicator (VGSI) beam widths and location on the heliport should be conducted.

3. Previous heliport MLS testing had identified the fact the pilots had the least difficulty with deceleration and landing when the elevation antenna was located well in front of the landing area. With deceleration difficulties noted in these tests, that work should be revisited and consideration given to relocation of the elevation antenna at heliports.

4. The HALS configuration tested resulted from considerable preliminary development efforts conducted over a period of several years. The length of the system can be shortened; however, any reduction in length would result in an increase in minimums. Conversely, any lengthening of the HALS system would result in a decrease in minimums but with a real estate penalty. Therefore, we recommend the basic HALS configuration used be considered standard and individual nonstandard sites be tailored accordingly.

5. Development of advanced instrument procedures for use at heliports and vertiports should continue. Several topics which should be addressed include deceleration below Vmini airspeeds prior to decision height (DH), range/range rate biasing of the flight director pitch cue and pilot performance when manually flying flight director aided approaches to heliports.

6. Expanded testing to augment the data with data from the S-76 should be considered.

REFERENCES

1. Interagency Agreement DTFA01-80-Y-10530 between the FAA and Department of the Army, U.S. Army Avionics Research and Development Activity, FAA Handbook 8620.3b, United States Standard for Terminal Instrument Procedures (TERPS), July 1976.

2. Interagency Agreement DTFA01-80-Y-10530 between the FAA and Department of the Army, U.S. Army Avionics Research and Development Activity.

3. FAA Advisory Circular, Heliport Design, AC 150/5390-2, January 4, 1988.

APPENDIX A

UH-1H HELICOPTER TECHNICAL INFORMATION

WEIGHT AND BALANCE CLEARANCE FORM F

TRANSPORT

(USE REVERSE FOR TACTICAL MISSIONS)

Cross Reference
RAF Form 2670
RCAF Form F. 115 C
80M 5-61 (6797)

FOR USE IN
T.O. 1-1B-40
AN 01-1B-40 &
TM 55-405-9

DATE	AIRCRAFT TYPE	FROM	HOME STATION
	JUH-1H		N.E.L
MISSION/TRIP/FLIGHT/NO.	**SERIAL NO.**	**TO**	**PILOT**
As Required	70-16344		P. D[illegible]

LIMITATIONS

CONDITION	TAKEOFF	LANDING	LIMITING WING FUEL
[1] ALLOWABLE GROSS WEIGHT	9500	9500	
TOTAL AIRCRAFT WEIGHT (*Ref. 11*)	7750		
OPERATING WEIGHT PLUS ESTIMATED LANDING FUEL WEIGHT		6867	
OPERATING WEIGHT (*Ref. 8*)			6392
ALLOWABLE LOAD (*Ref. 13*) (use *SMALLEST figure*)	1750	2633	—
[4] PERMISSIBLE C. G. TAKEOFF	FROM 130	TO ~~(% M.A.C. or~~ IN.) 144	
[4] PERMISSIBLE C. G. LANDING	FROM 130	TO ~~(% M.A.C. or~~ IN.) 144	
[1] LANDING FUEL WEIGHT	475		

REF	ITEM	WEIGHT	[1] INDEX OR MOM/ 100
1	BASIC AIRCRAFT (*From Chart C*)	5992	35[illegible]
2	OIL (IN BASIC Gal.)		
3	CREW (No. 2)	400	13[illegible]
4	CREW'S BAGGAGE		
5	STEWARD'S EQUIPMENT		
6	EMERGENCY EQUIPMENT		
7	EXTRA EQUIPMENT		
8	OPERATING WEIGHT	6392	8874
9	TAKEOFF FUEL (JP4-209 Gal.)	1358	2074
10	WATER INJ. FLUID (— Gal.)		
11	TOTAL AIRCRAFT WEIGHT	7750	10972

REMARKS

MLS HELIPORT
SITING CRITERIA
A/C CONFIGURATION

SOLO CG 143.85

12 DISTRIBUTION OF ALLOWABLE LOAD (PAYLOAD)

COMPT	UPPER COMPARTMENTS PASSENGERS NO.	PASSENGERS WEIGHT	CARGO	COMPT	LOWER COMPARTMENTS PASSENGERS NO.	PASSENGERS WEIGHT	CARGO	WEIGHT	INDEX OR MOM/
A									
B	2	400	FS 85.0					400	33[illegible]
C									
D									
E									
F									
G									
H									
I									
J									
K									
L									
M									
N									
O									
P									
FWD	BELLY								
AFT	BELLY								

TOTAL FREIGHT	
TOTAL MAIL	

COMPUTER PLATE NUMBER (*If used*)

CHART E

[1] *Enter constant used.*
[2] *Enter values from current applicable T.O./TM*
[3] *Applicable to gross weight (Ref. 13).*
[4] *Applicable to gross weight (Ref. 20).*
[5] *Ref. 9 minus Ref. 17.*

CORRECTIONS (*Ref. 14*)

COMPT	ITEM	CHANGES (+ or −) WEIGHT	[1] INDEX OR MOM/
	TOTAL WEIGHT REMOVED	−	−
	TOTAL WEIGHT ADDED	+	+
	NET DIFFERENCE (*Ref. 14*)		

REF	ITEM	WEIGHT	INDEX OR MOM/
13	TAKEOFF CONDITION (*Uncorrected*)	8150	11237
14	CORRECTIONS (*If required*)		
15	TAKEOFF CONDITION (*Corrected*)		
16	TAKEOFF C. G. ~~IN % M. A. C. OR~~ IN.	138.45	
17	LESS FUEL 135.8 GAL	−883	−1466
18	LESS AIR SUPPLY LOAD DROPPED		
19	MISC. VARIABLES		
20	ESTIMATED LANDING CONDITION	7267	9813
21	ESTIMATED LANDING C. G. ~~IN % M. A. C. OR~~ IN.	135.1	

COMPUTED BY

[illegible] DAC
SIGNATURE

WEIGHT AND BALANCE AUTHORITY

SIGNATURE

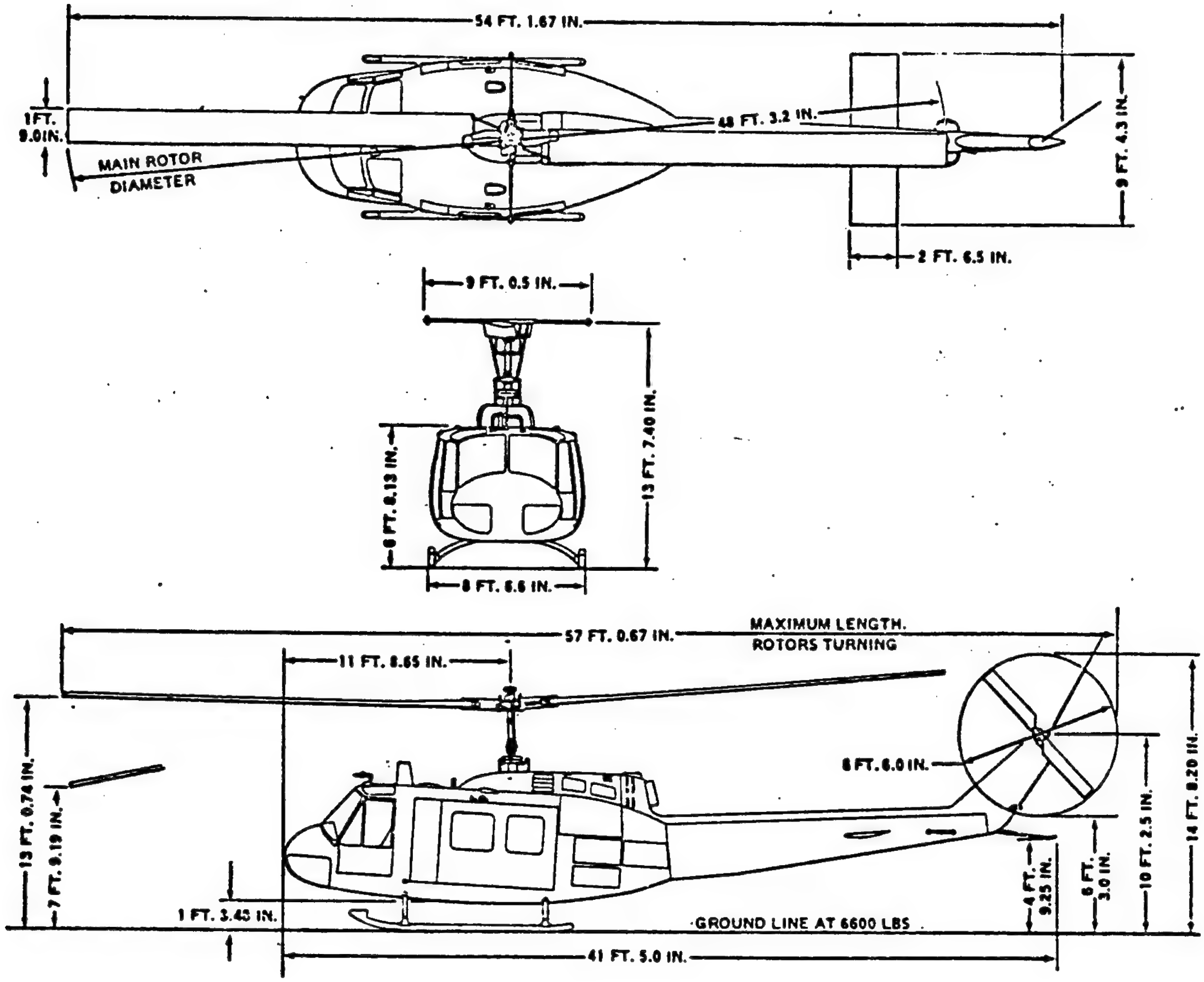
PILOT

[illegible] DAC
SIGNATURE

NOTE.—THIS TRANSPORT CLEARANCE FORM HAS RESULTED FROM TRIPARTITE AGREEMENT AND NO FURTHER CHANGES MAY BE MADE TO IT WITHOUT PRIOR CONSIDERATION BY TRIPARTITE AUTHORITIES.

DD FORM 1 SEPT 54 365F

UH-1H AIRCRAFT DIMENSIONS



APPENDIX B

SUBJECT PILOT QUESTIONNAIRES

IN-FLIGHT QUESTIONNAIRE

Pilot:________________ Run (Approach) No.________ Date:___________

Note: All responses should be made by circling the number most descriptive of the degree of guidance received or workload involved.

1. Did the lighting system displayed for use during this approach provide sufficient guidance, at decision height, to allow you to complete the approach to landing visually?

Excellent Guidance									Insufficient Guidance
1	2	3	4	5	6	7	8	9	10

2. Did the system displayed provide adequate alignment guidance to permit proper maneuvering to the centerline of the helipad prior to landing?

Excellent Guidance									Insufficient Guidance
1	2	3	4	5	6	7	8	9	10

3. Did the system displayed provide adequate visual cues for determining rate of closure and/or deceleration during the visual portion of the approach?

Excellent Cues									Insufficient Cues
1	2	3	4	5	6	7	8	9	10

4. How would you rate your workload during the visual portion of the approach?

Extremely Light									Excessively Heavy
1	2	3	4	5	6	7	8	9	10

5. How would you rate aircraft controlability during the visual segment of the approach?

Easy to Control									Very Difficult to Control
1	2	3	4	5	6	7	8	9	10

TABLE . POST-FLIGHT QUESTIONAIRE

Pilot: Date:

1. Do you feel that the Centerline Approach Lighting System is required or essential, as an addition to the basic IFR lighting system (Cross) under the following MLS approach angle operations?

Approach Angle	Required	Not Required
3.0 degrees		
4.5 degrees		
6.0 degrees		

2. If you have checked the Centerline Approach Lighting System as required for any of the above approach angles, please describe the form of additional guidance that you feel it provides.

3. In the event that the Centerline Approach Lighting System component cannot be provided (i.e. because of lack of clear space in the approach zone, etc.), do you feel that the published approach minimums (Decision Height/Visibility should be increased?

Yes No

4. In general, do you feel that your ability to execute a safe and expeditious transition from instrument to visual flight was enhanced on those approaches during which the Centerline Approach Lighting System was provided for use?

Yes No It really didn't matter

5. Can you think of any changes or additions to the Heliport Approach Lighting System tha you feel should bve incorporated?

TABLE . POST-FLIGHT QUESTIONAIRE

Pilot:______________________________ Date:________________________________

1. Do you feel that the Centerline Approach Lighting System is required or essential, as an addition to the basic IFR lighting system (Cross) under the following MLS approach angle operations?

Approach Angle	Required	Not Required
3.0 degrees	______________	______________
4.5 degrees	______________	______________
6.0 degrees	______________	______________

2. If you have checked the Centerline Approach Lighting System as required for any of the above approach angles, please describe the form of additional guidance that you feel it provides.

____

____

____

3. In the event that the Centerline Approach Lighting System component cannot be provided (i.e. because of lack of clear space in the approach zone, etc.), do you feel that the published approach minimums (Decision Height/Visibility should be increased?

Yes ________ No ________

4. In general, do you feel that your ability to execute a safe and expeditious transition from instrument to visual flight was enhanced on those approaches during which the Centerline Approach Lighting System was provided for use?

Yes ________ No ________ It really didn't matter ________

5. Can you think of any changes or additions to the Heliport Approach Lighting System tha you feel should bve incorporated?

____

____

____

____

TABLE . POST-FLIGHT PILOT BACKGROUND QUESTIONAIRE

Helicopter Visual Cueing Aircraft Type : ______________________

Pilot Qualifications

Name : ____

Affiliation : ____

Address : ____

City : ____________________ State : __________ Zip : __________

Phone (optional) : ___________________________________

FAA Helicopter Ratings : _____________________________

____

Total Flight Hours : _________________________________

Total Helicopter Hours : _____________________________

Total Time In Type : _________________________________

Total Helicopter Hours Last 6 Months : ________________

Time In Type Last 6 Months : __________________________

APPENDIX C

SUBJECT PILOT BACKGROUND INFORMATION

SUBJECT PILOT 1 BACKGROUND QUESTIONNAIRE

Affiliation - Petroleum Helicopters Inc.

FAA Helicopter Ratings - ATP/Rotorcraft-Helicopter

BH206,BH212,S-76

Total Flight Hours - 12,466

Total Helicopter Hours - 12,286

Total Hours in UH-1H Type - 1,185

Helicopter Instrument Flight Hours - 541

Helicopter Night Flight Hours - 428

SUBJECT PILOT 2 BACKGROUND QUESTIONNAIRE

Affiliation - FAA Technical Center

FAA Helicopter Ratings - Commercial, Instrument

S-65, Instrument Instructor

Total Flight Hours - 7,000

Total Helicopter Hours - 600

Total Hours in UH-1H Type - 75

Helicopter Instrument Flight Hours - 100

Helicopter Night Flight Hours - 4

SUBJECT PILOT 3 BACKGROUND QUESTIONNAIRE

Affiliation - FAA Technical Center

FAA Helicopter Ratings - ATP, CFI

Total Flight Hours - 3,800

Total Helicopter Hours - 2,380

Total Hours in UH-1H Type - 1,800

Helicopter Instrument Flight Hours - 283

Helicopter Night Flight Hours - 131

SUBJECT PILOT 4 BACKGROUND QUESTIONNAIRE

Affiliation - FAA - Sacramento FIFO

FAA Helicopter Ratings - ATP, CFI - Helo and Instrument

Total Flight Hours - 8,000

Total Helicopter Hours - 1,000

Total Hours in UH-1H Type - 800

Helicopter Instrument Flight Hours - 100 Simulator and Hood

Helicopter Night Flight Hours - 100

SUBJECT PILOT 5 BACKGROUND QUESTIONNAIRE

Affiliation - FAA Technical Center

FAA Helicopter Ratings - Rotorcraft Helicopter

Total Flight Hours - 1,550

Total Helicopter Hours - 1,550

Total Hours in UH-1H Type - 210

Helicopter Instrument Flight Hours - 150

Helicopter Night Flight Hours - 200

SUBJECT PILOT 6 BACKGROUND QUESTIONNAIRE

Affiliation - USAF IFC/IP

FAA Helicopter Ratings - Rotorcraft Helicopter

Total Flight Hours - 3,100

Total Helicopter Hours - 3,000

Total Hours in UH-1H Type - 2,700

Helicopter Instrument Flight Hours - 60

Helicopter Night Flight Hours - 100

SUBJECT PILOT 7 BACKGROUND QUESTIONNAIRE

Affiliation - FAA Technical Center

FAA Helicopter Ratings - Commercial Instrument Type SK-58

Total Flight Hours - 8,300

Total Helicopter Hours - 7,100

Total Hours in UH-1H Type - 5,100

Helicopter Instrument Flight Hours - 350

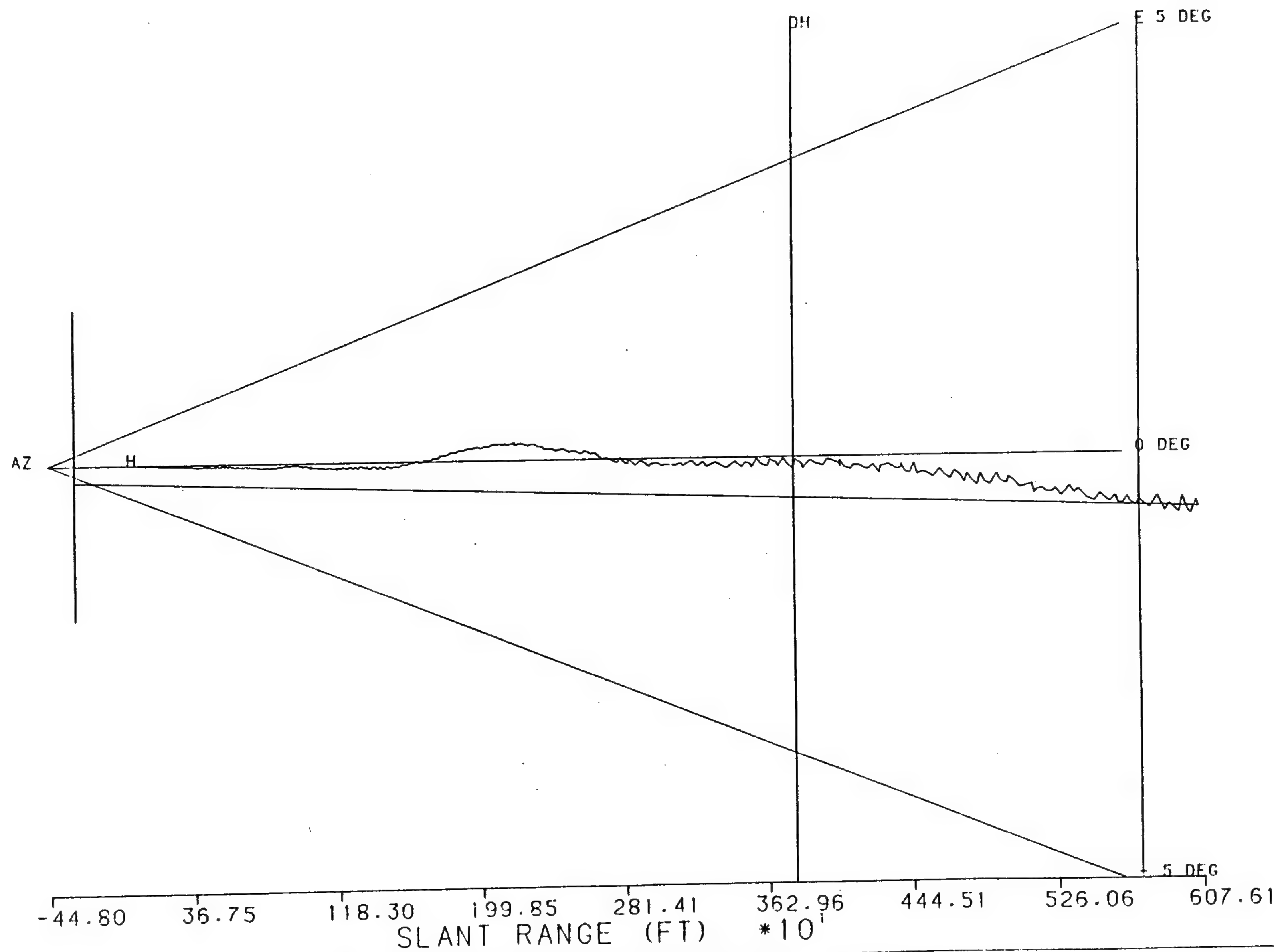
Helicopter Night Flight Hours - 1320

APPENDIX D

SUBJECT PILOT LATERAL POSITION PLOTS

RUN # 1
7/7/88 UHI HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



DATA PROCESSED BY THE FAA TECHNICAL CENTER
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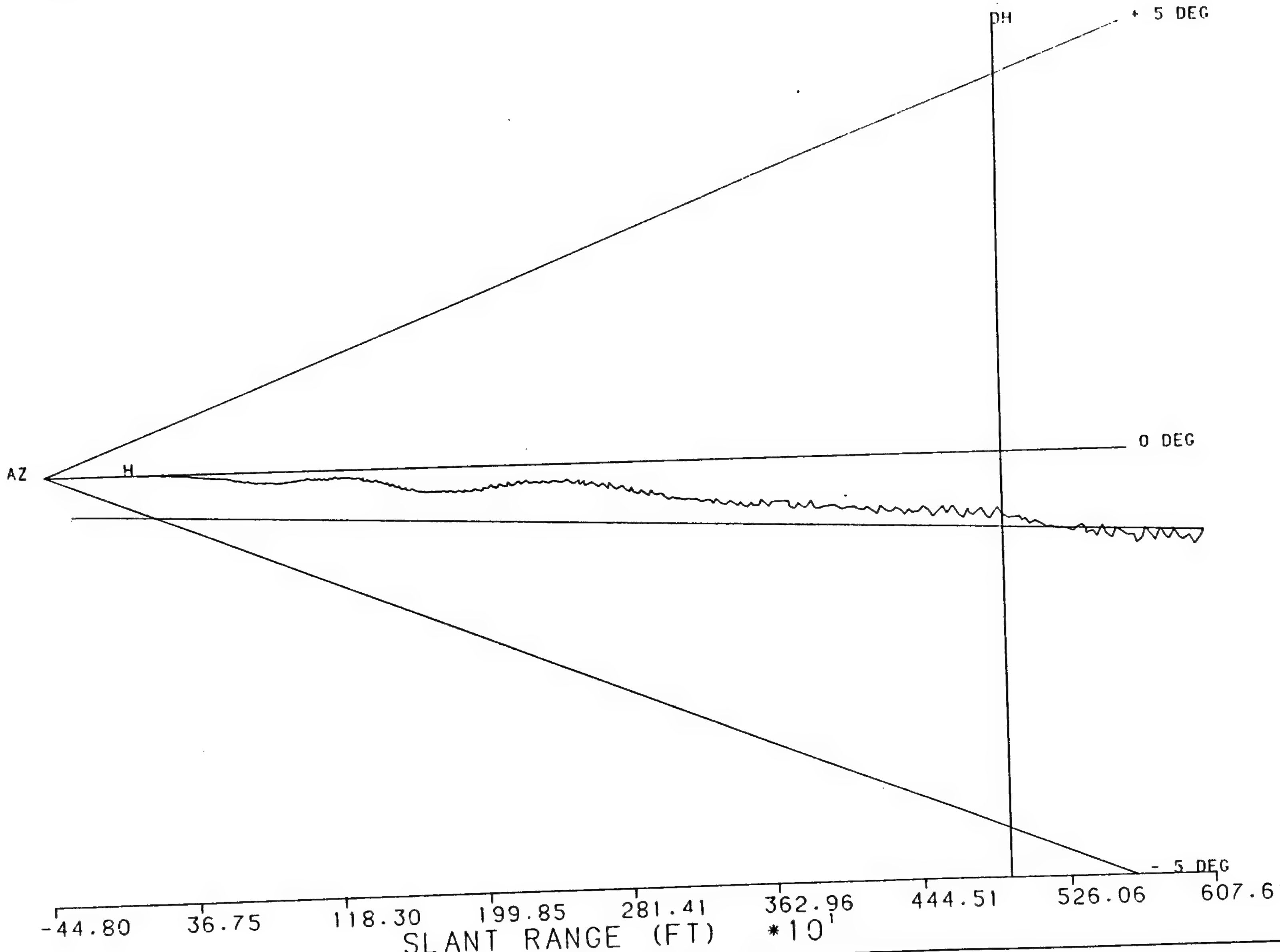
RUN # 2
7/7/88 UHI HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 3.00



RUN # 3
7/7/88 UH1 HALS 3.0 DEGREE FL 200 FT DH 5 DEGREE R AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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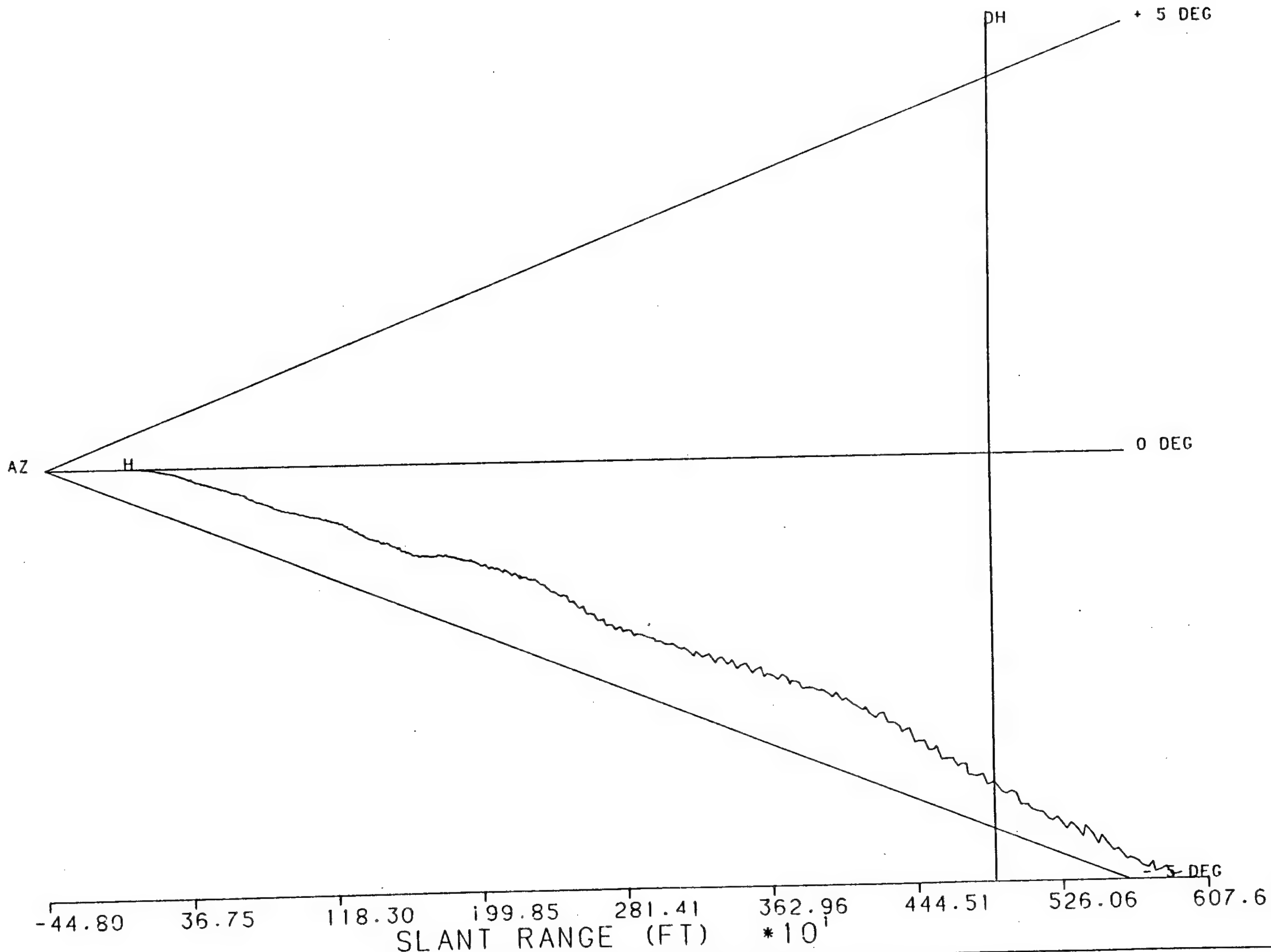
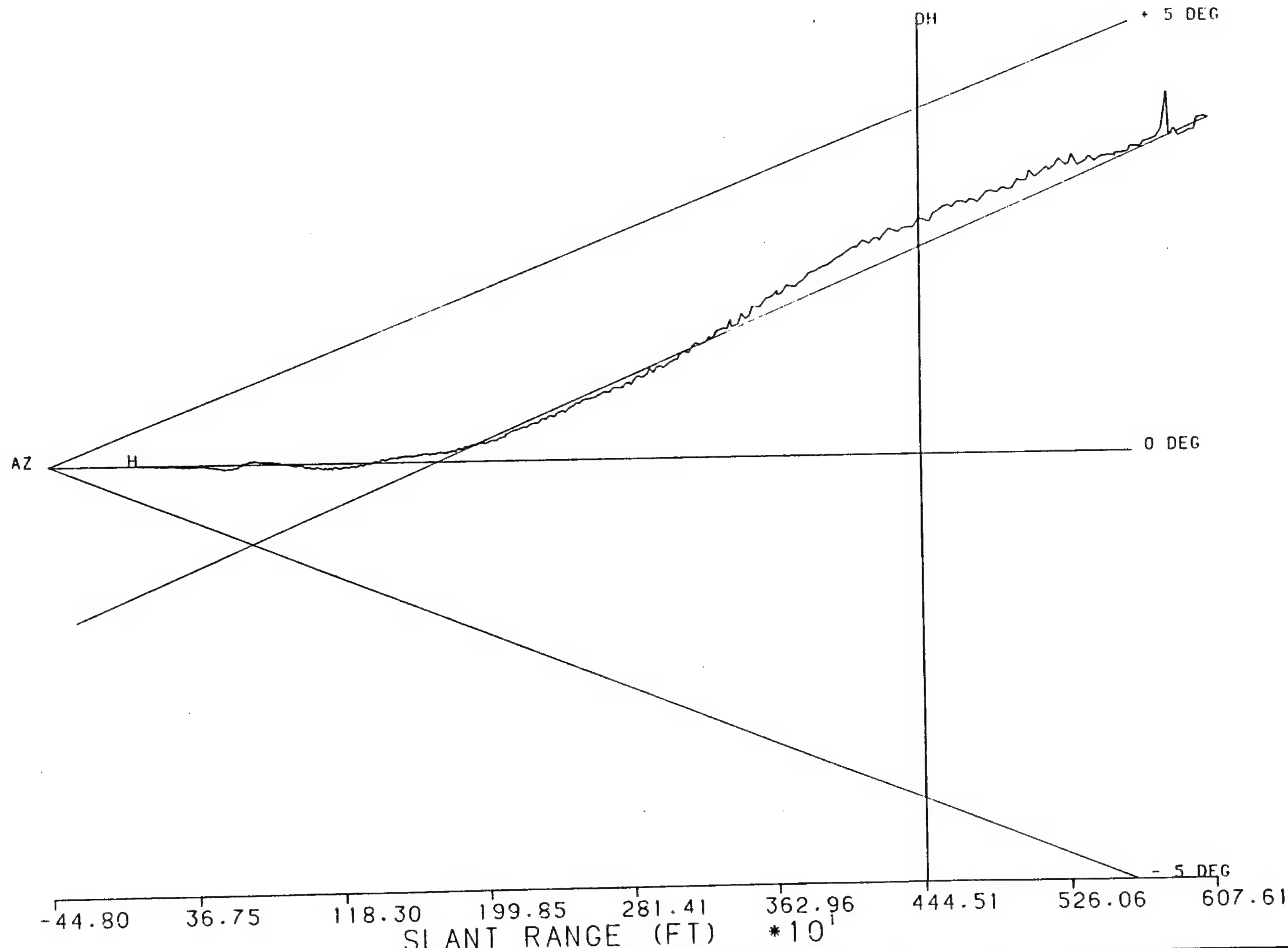
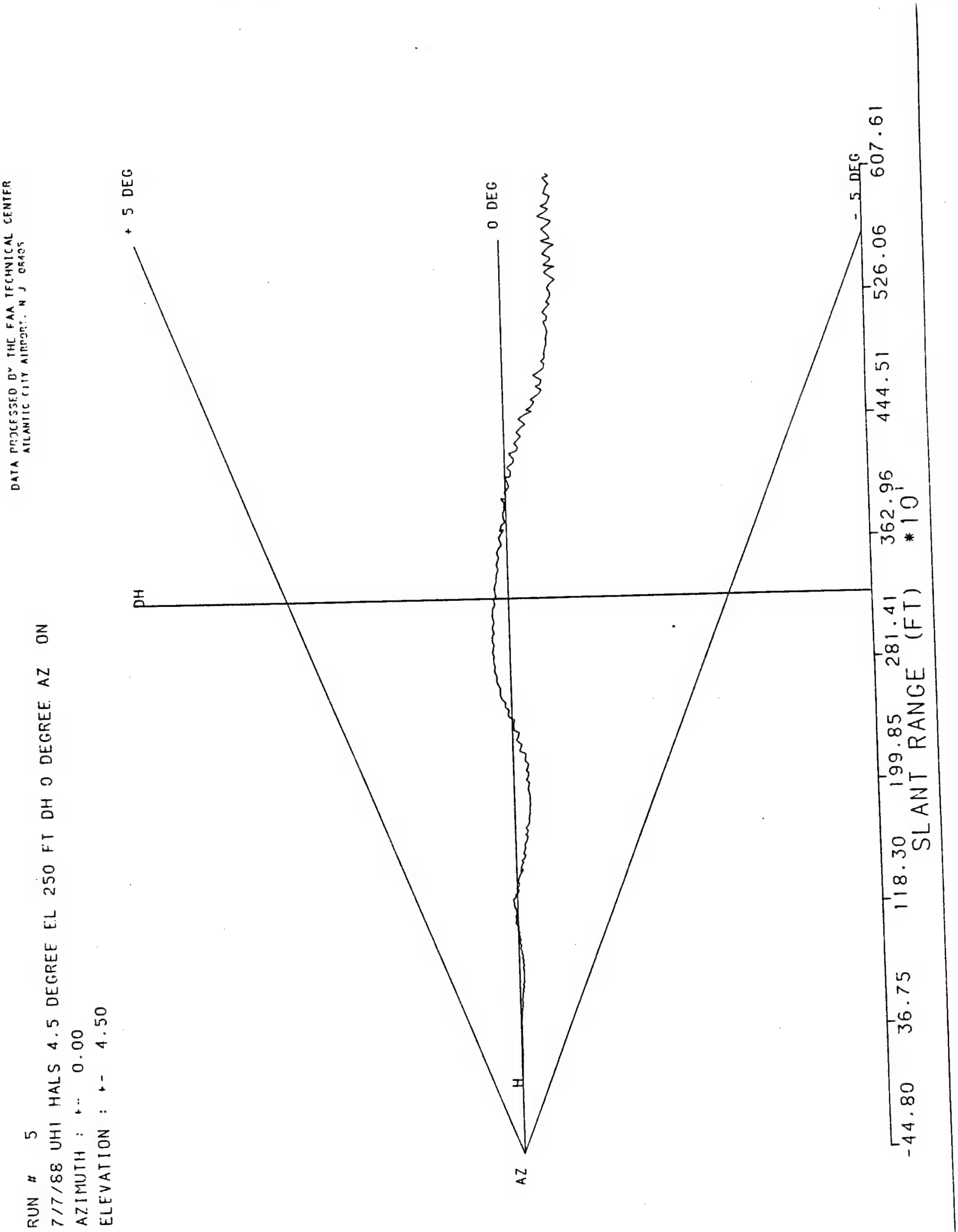


RUN # 4
7/7/88 UHI HALS 3.0 DEGREE FL 200 FT DH 5 DEGREE L AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

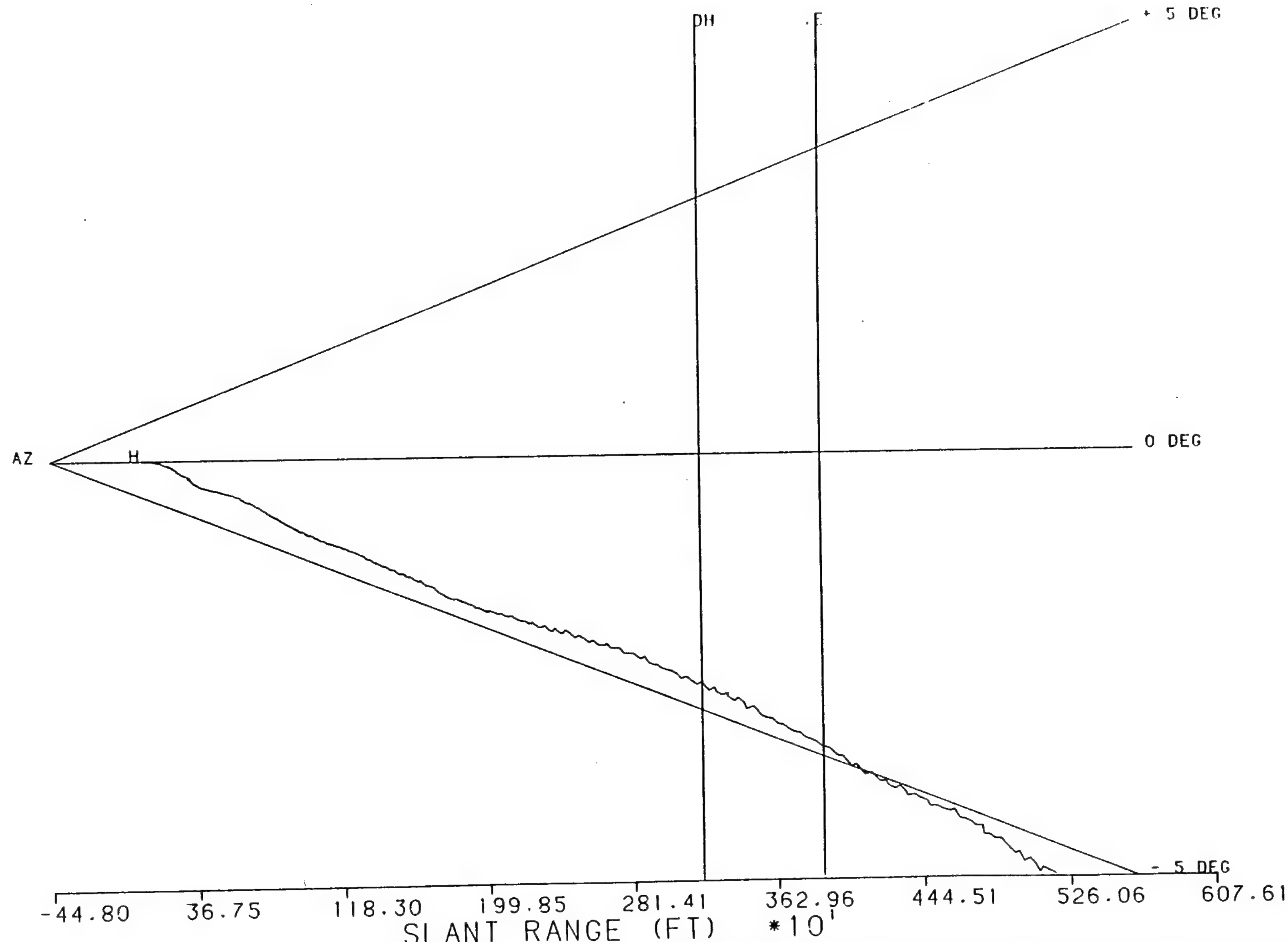
DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405




RUN # 5
7/7/88 UHI HALS 4.5 DEGREE EL 250 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 4.50
DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405
+ 5 DEG
0 DEG
- 5 DEG
DH
H
AZ
-44.80
36.75
118.30
199.85
281.41
362.96
444.51
526.06
607.61
SLANT RANGE (FT) *10[1]

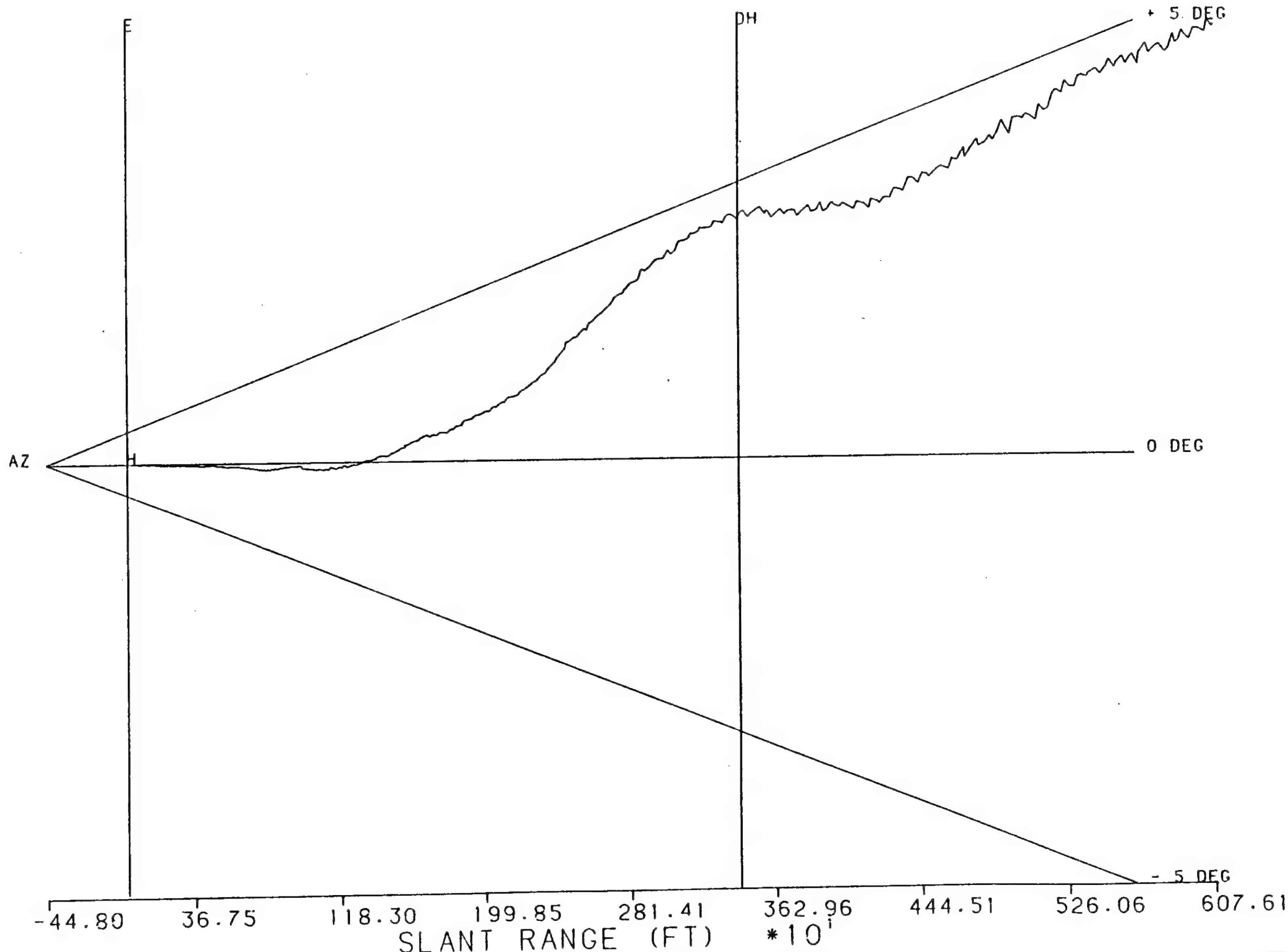
RUN #   6
7/7/88 UHI HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE R AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 7
7/7/88 UHI HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE L AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 8
7/7/UH1 HALS 6.0 DEGREE EL 250 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

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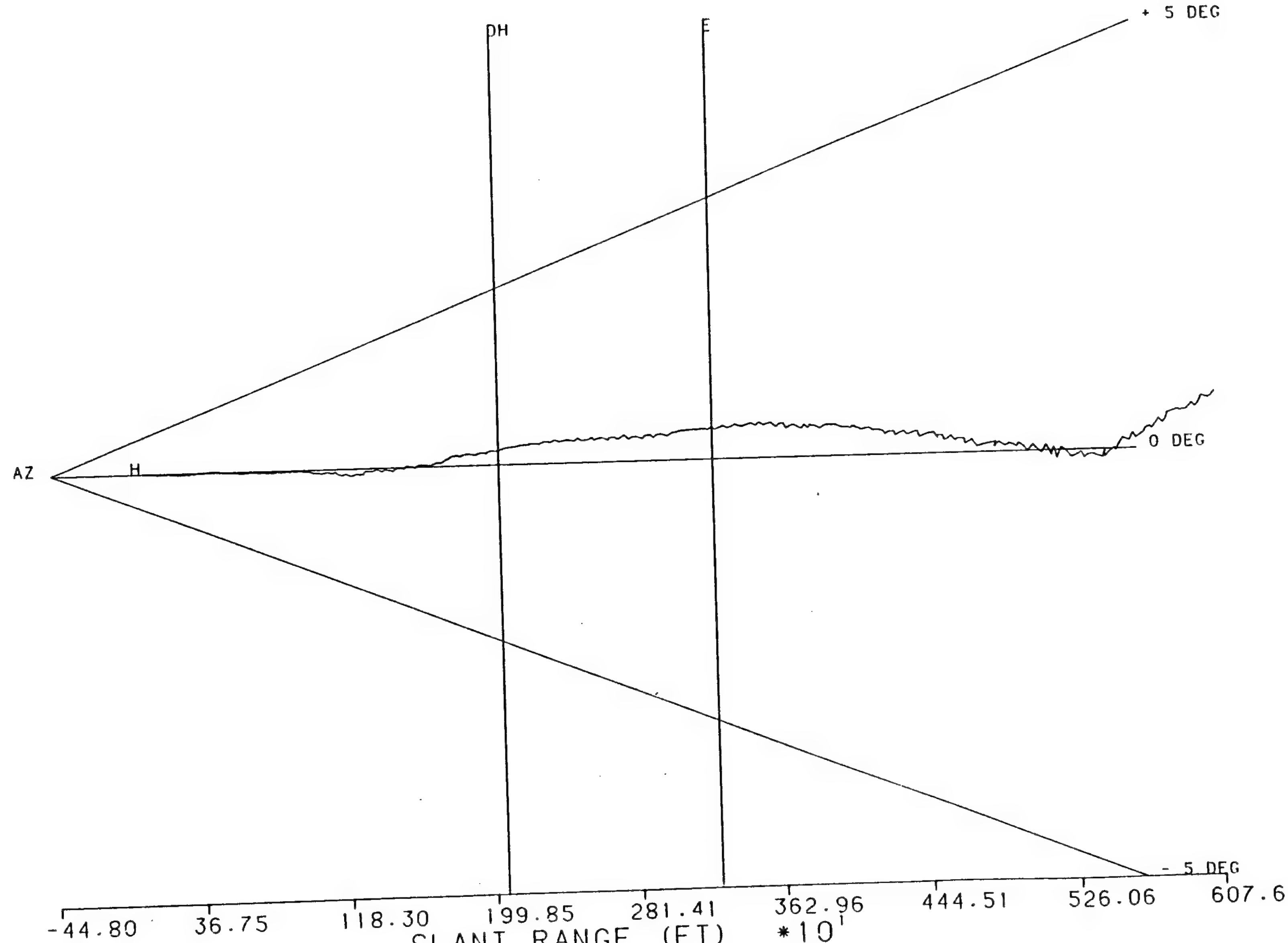

RUN # 9
7/7/88 UHI HALS 6.0 DEGREE EL 250 FT DH 5 DEGREE R AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

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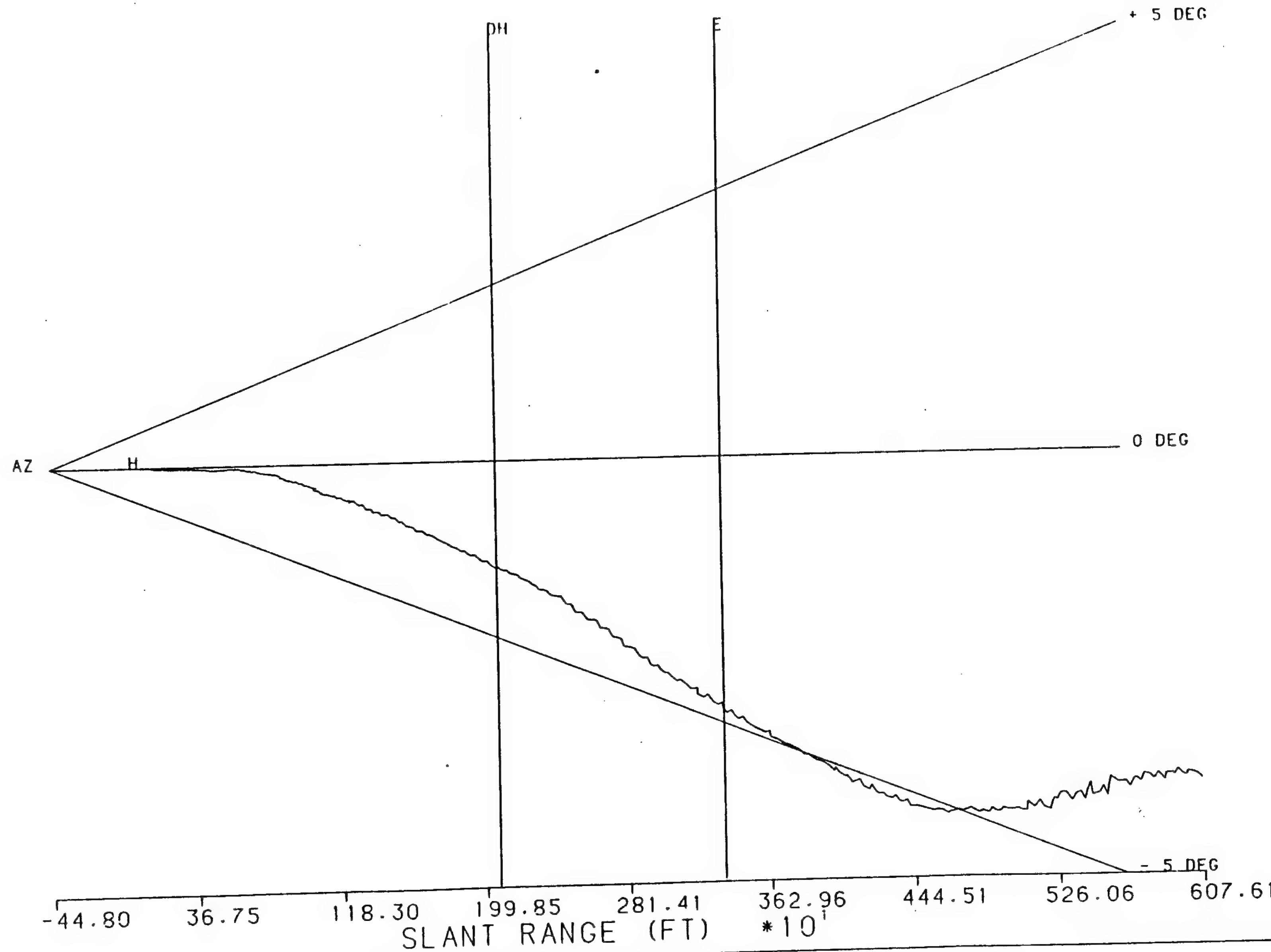
ATLANTIC CITY AIRPORT, N J 08405



RUN # 10
7/7/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 5 DEGREE L AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

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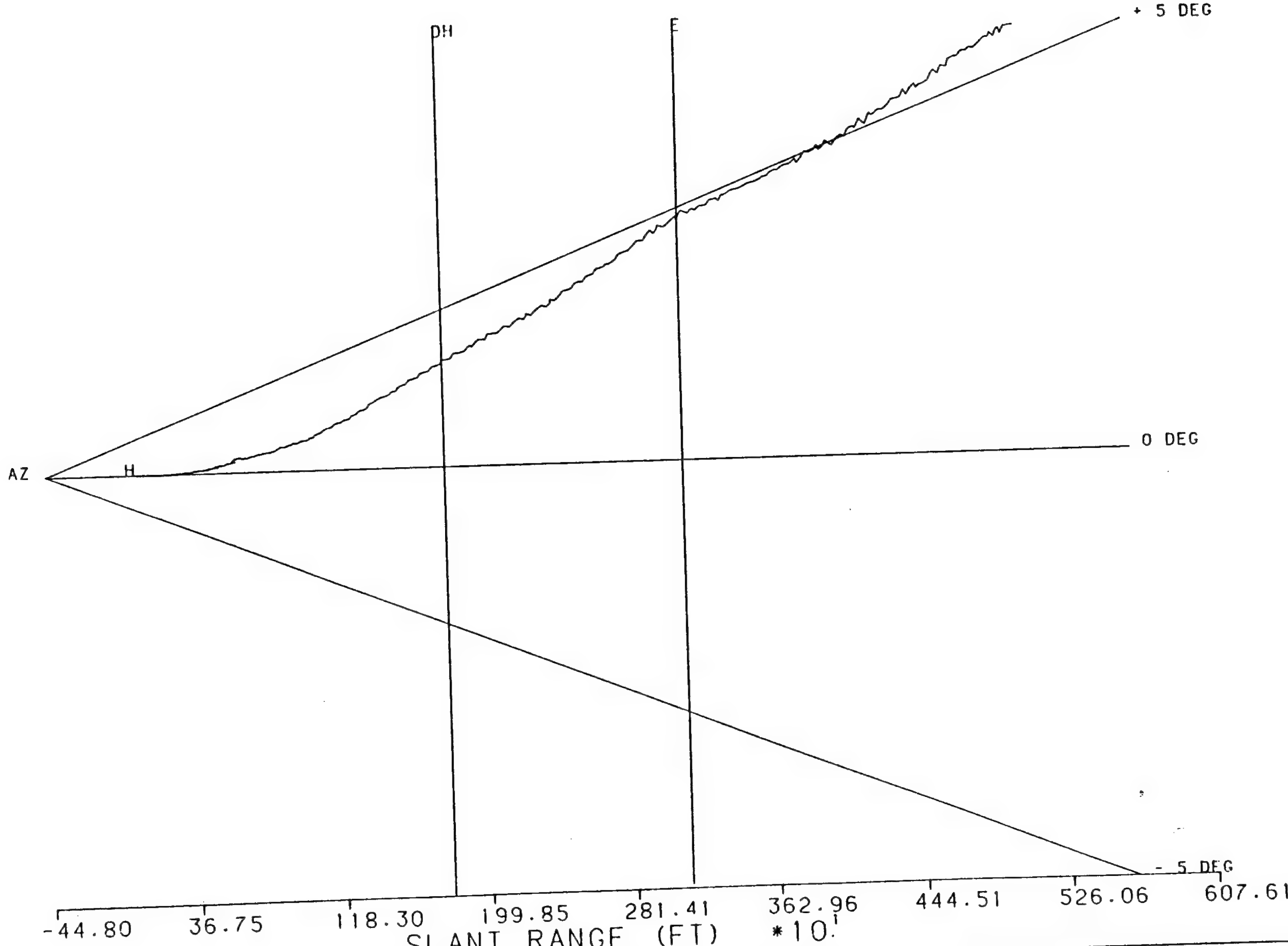

RUN # 1
6/28/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

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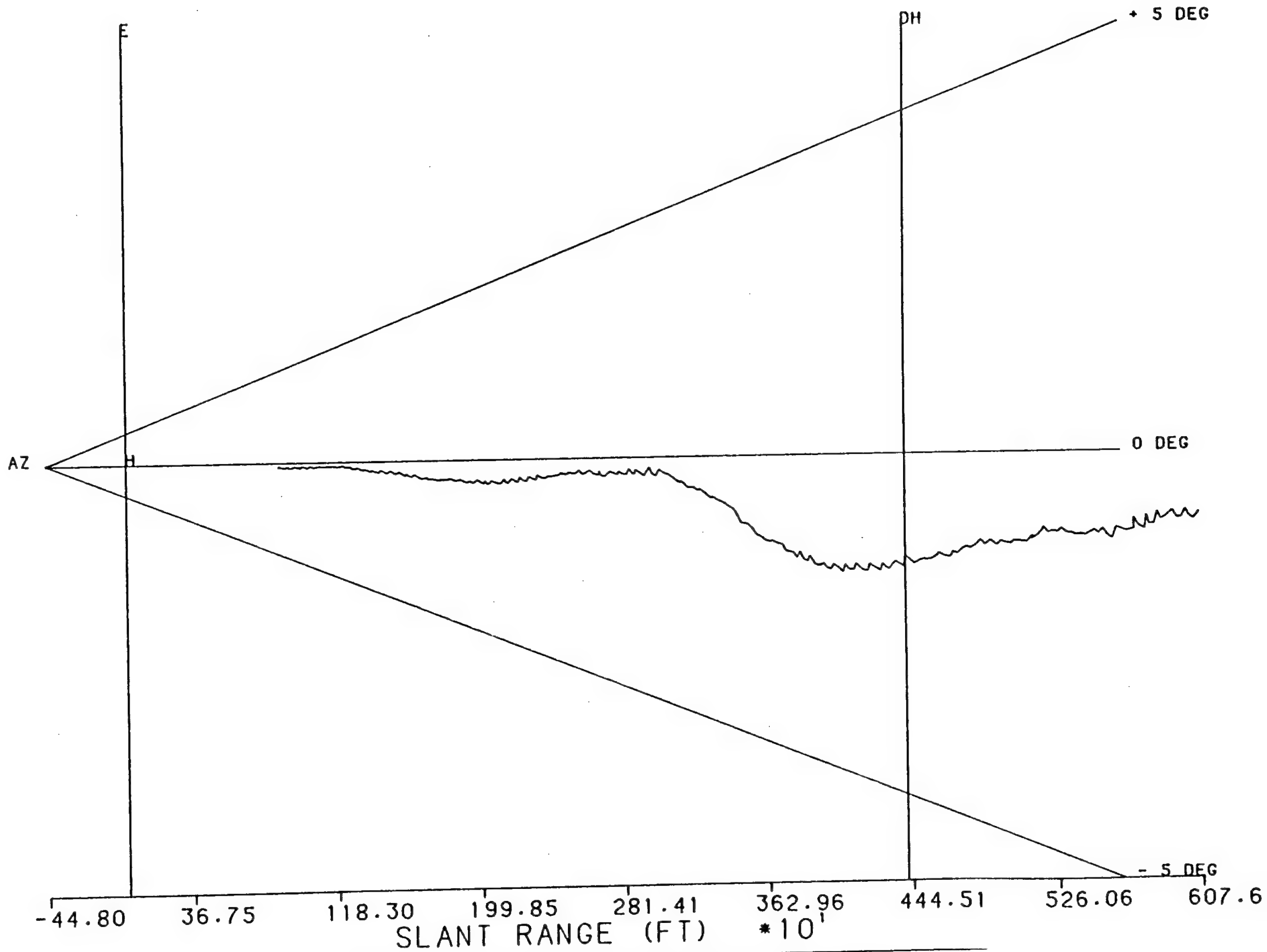
ATLANTIC CITY AIRPORT, N J 08405



RUN # 2
6/28/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

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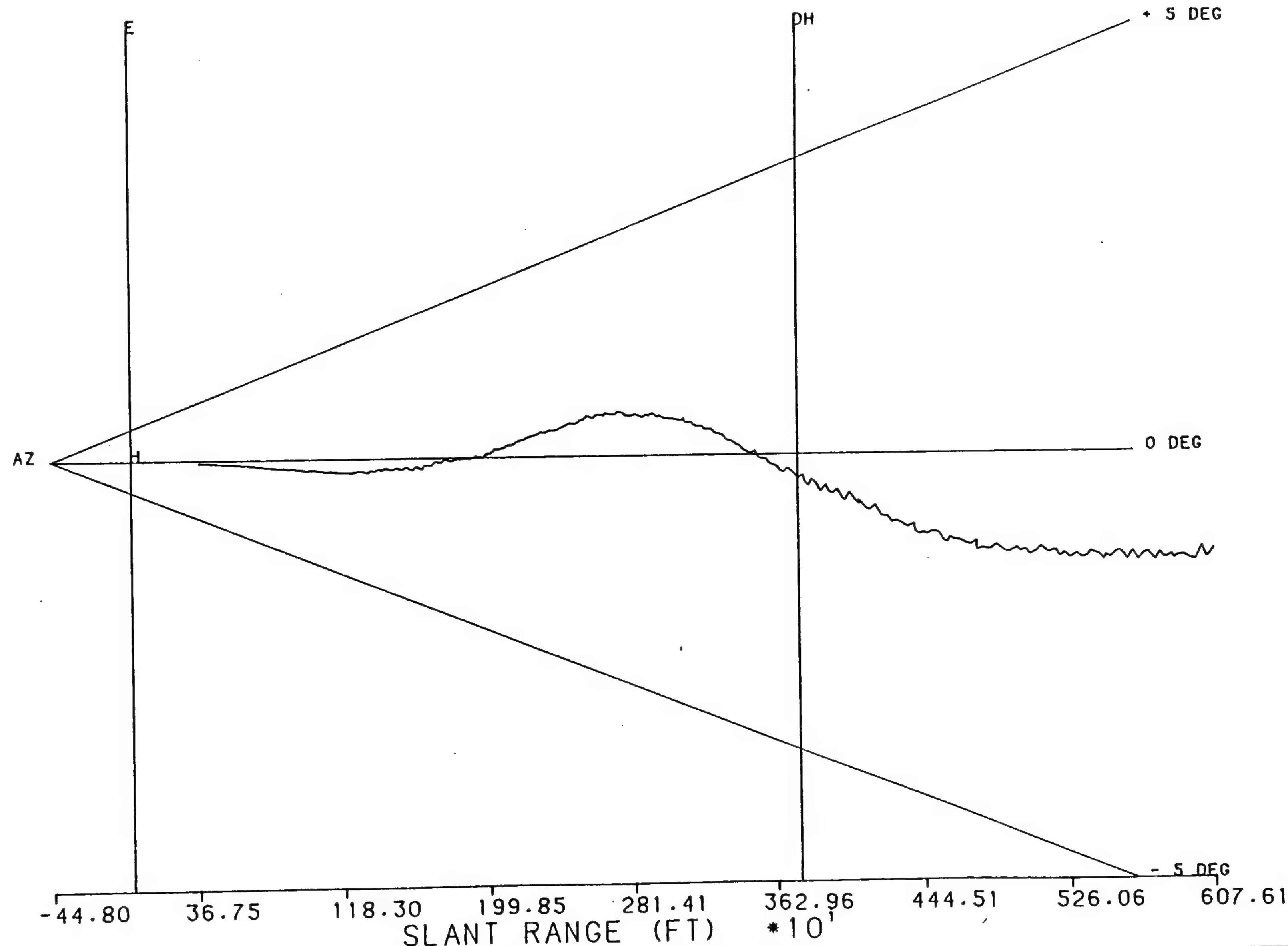

RUN # 3
6/28/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 5 DEGREE R AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

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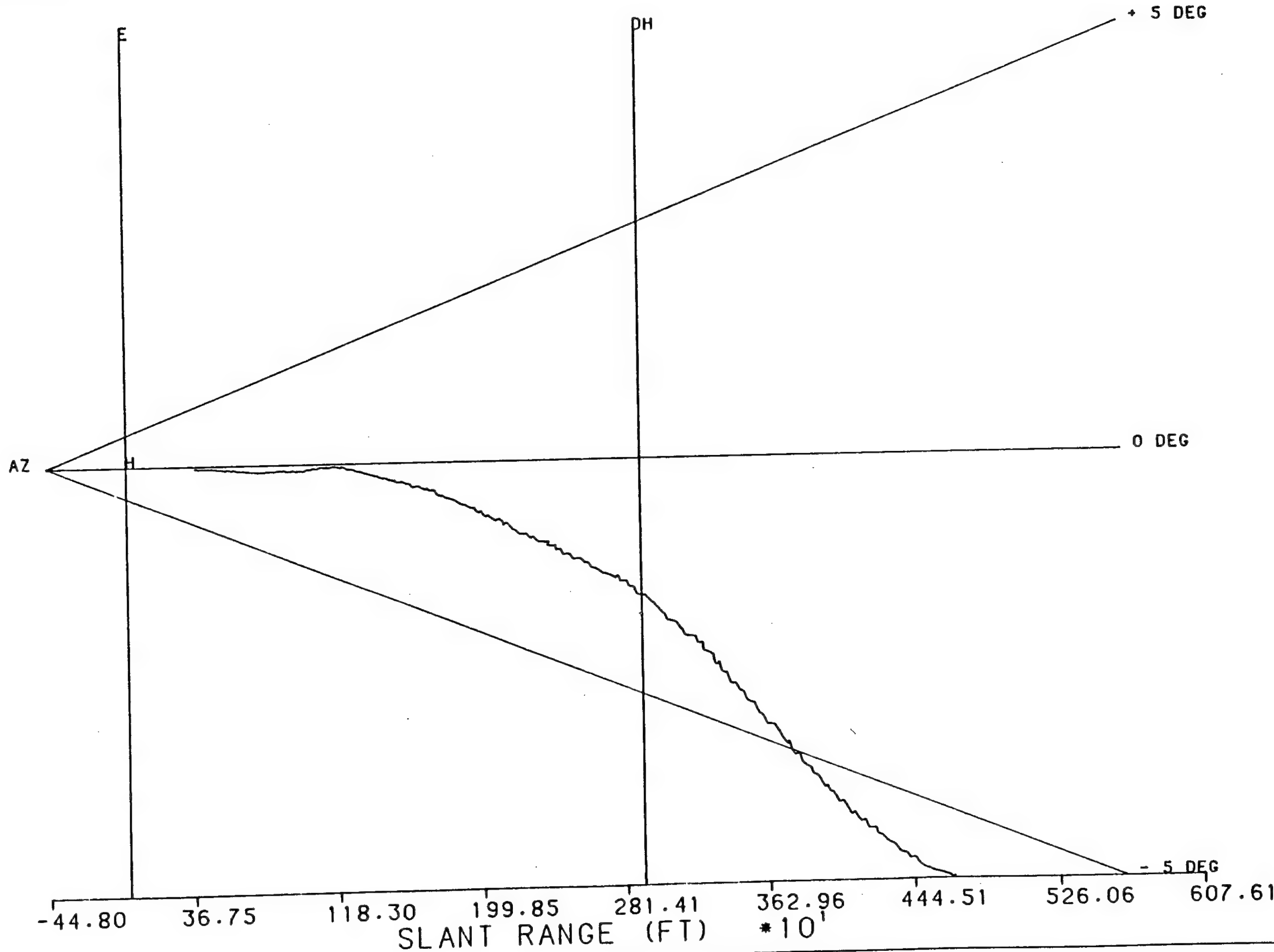
ATLANTIC CITY AIRPORT, N J 08405



RUN # 4
6/28/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 5 DEGREE L AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

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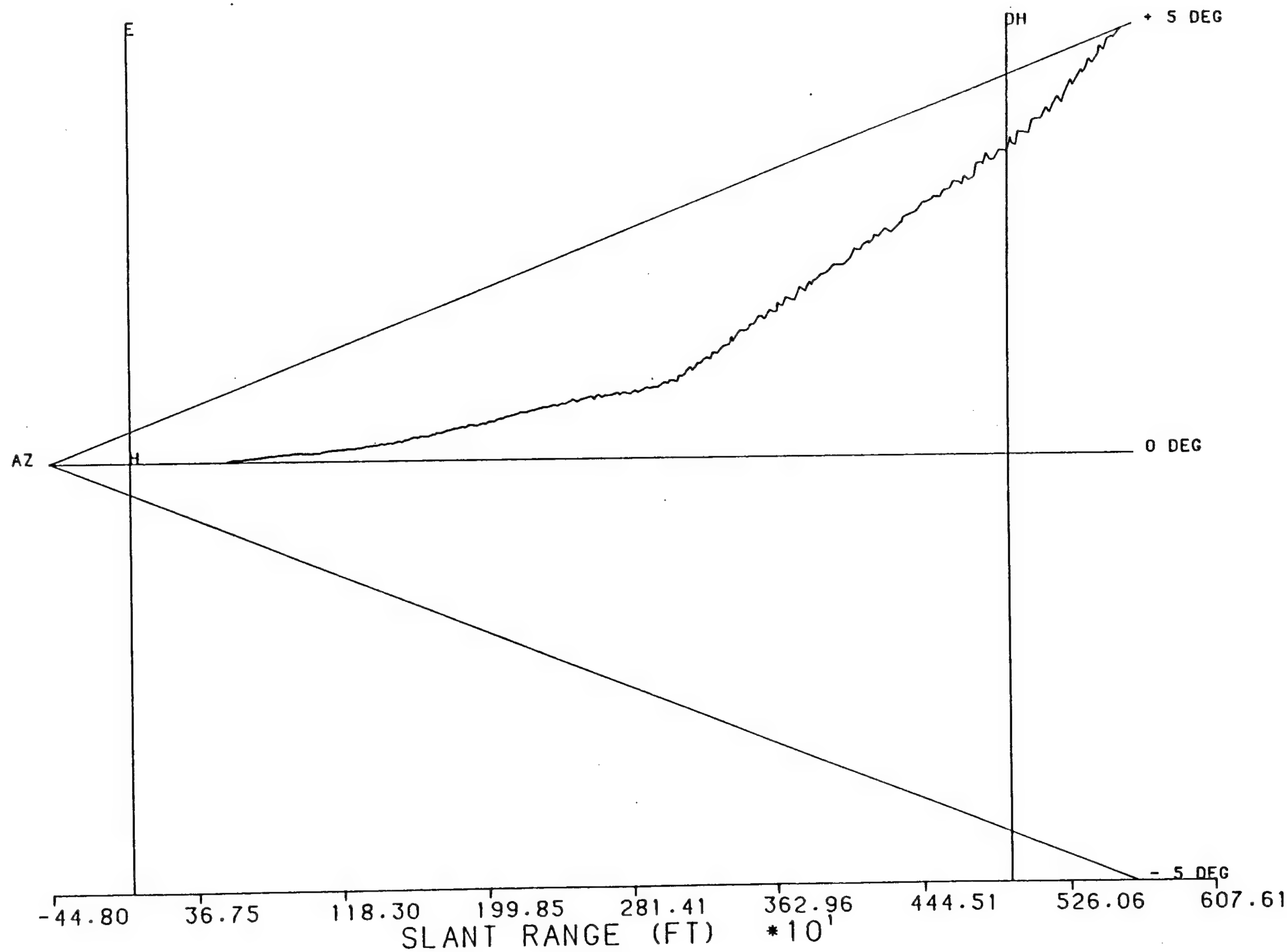
ATLANTIC CITY AIRPORT, N J 08405



RUN # 5

6/28/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 0 DEGREE AZ ON

AZIMUTH : +- 0.00

ELEVATION : +- 4.50

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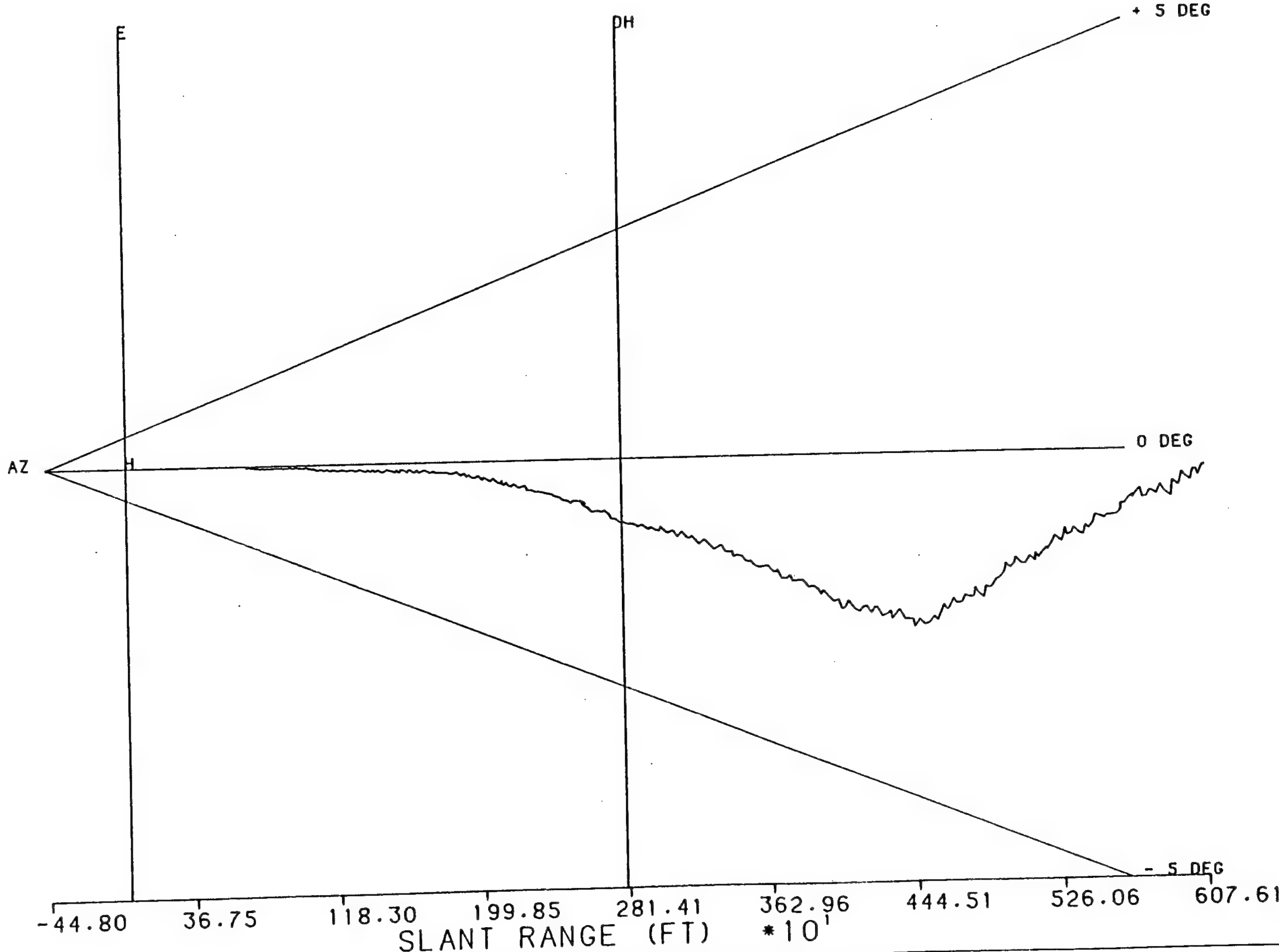
ATLANTIC CITY AIRPORT, N J 08405



RUN # 6
6/28/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE R AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

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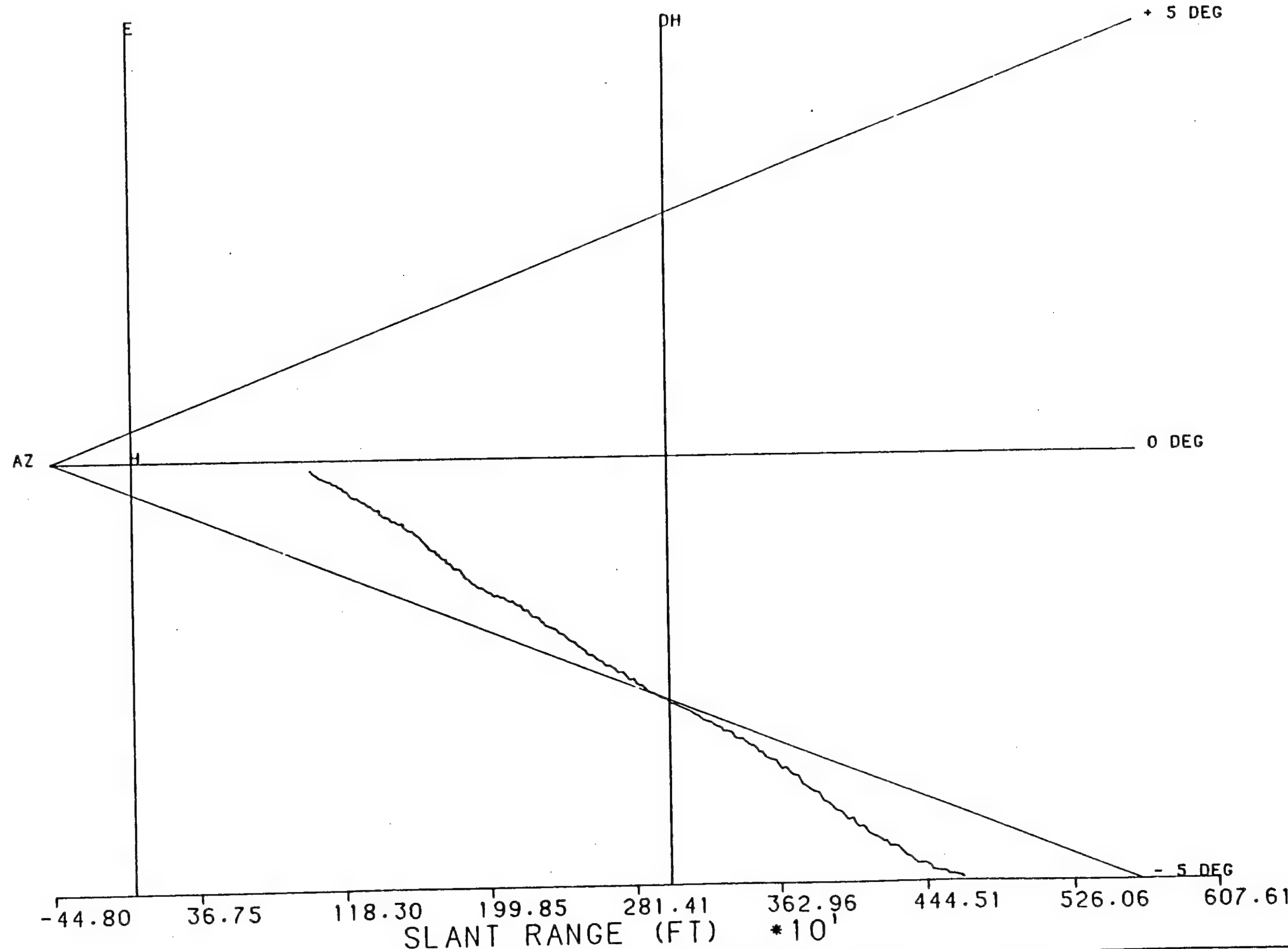
ATLANTIC CITY AIRPORT, N J 08405



RUN # 7
6/28/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE L AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

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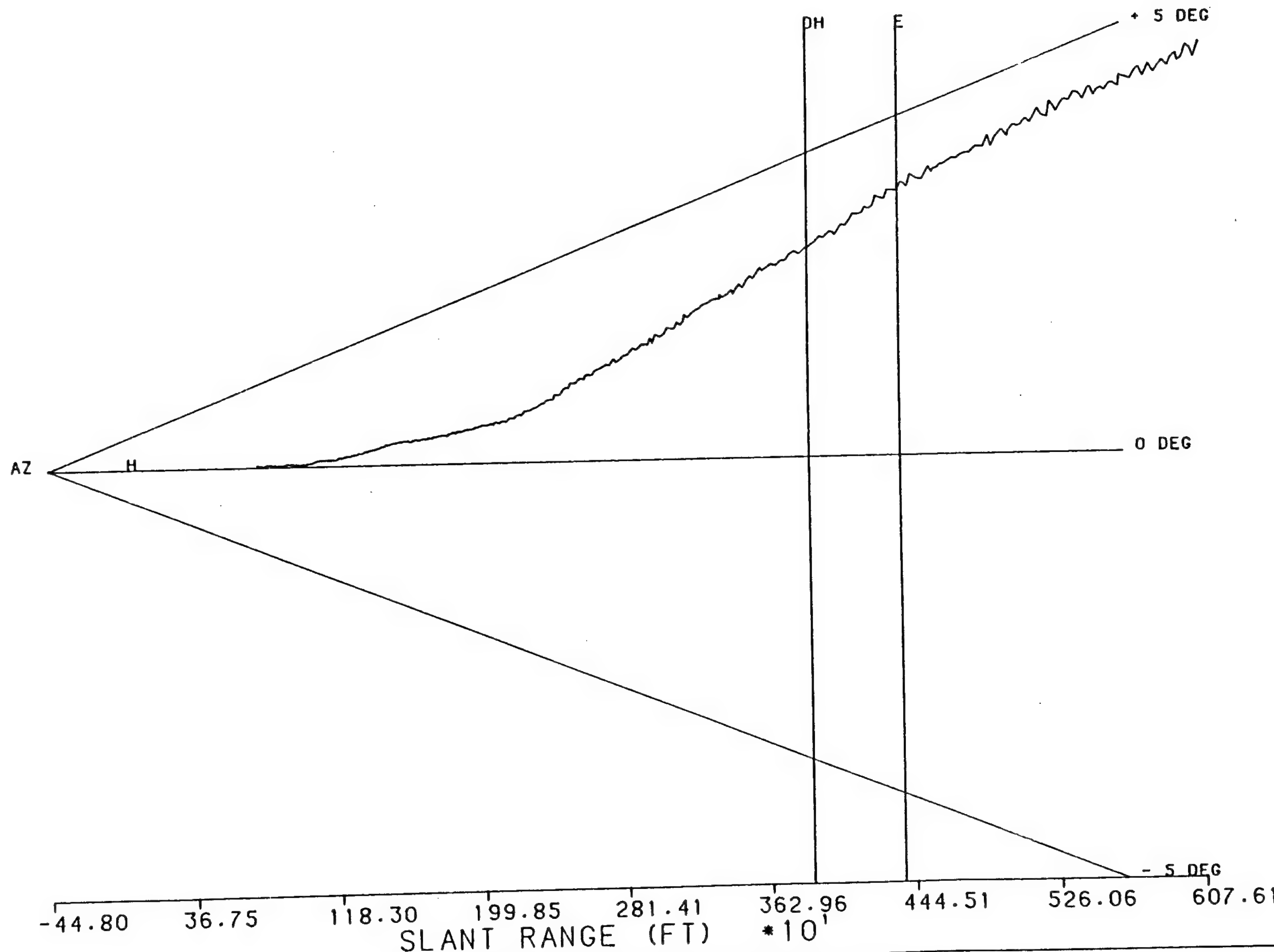
ATLANTIC CITY AIRPORT, N J 08405



RUN # 9
6/28/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 5 DEGREE R AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

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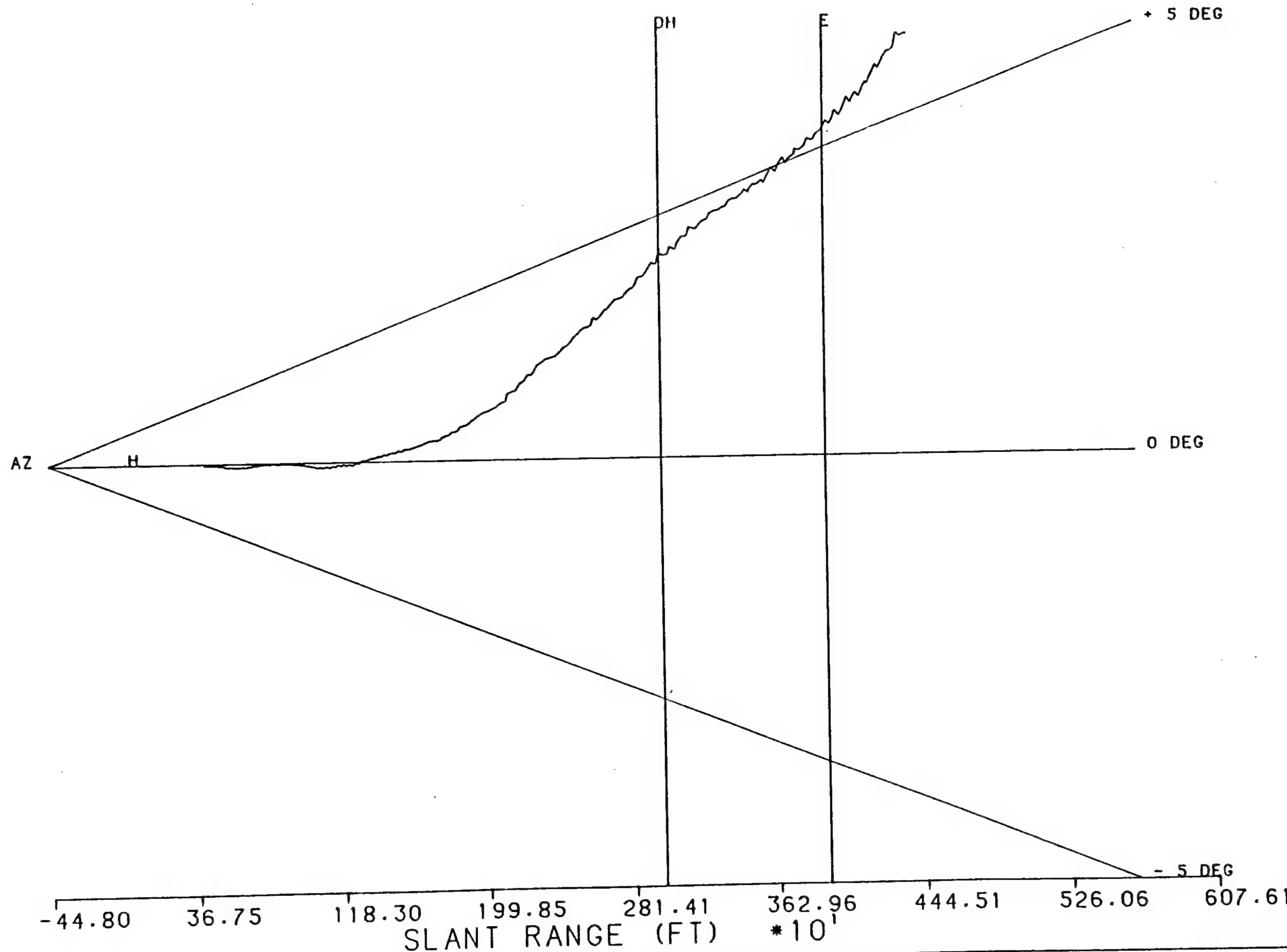
ATLANTIC CITY AIRPORT, N J 08405



RUN # 10
6/28/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 5 DEGREE L AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

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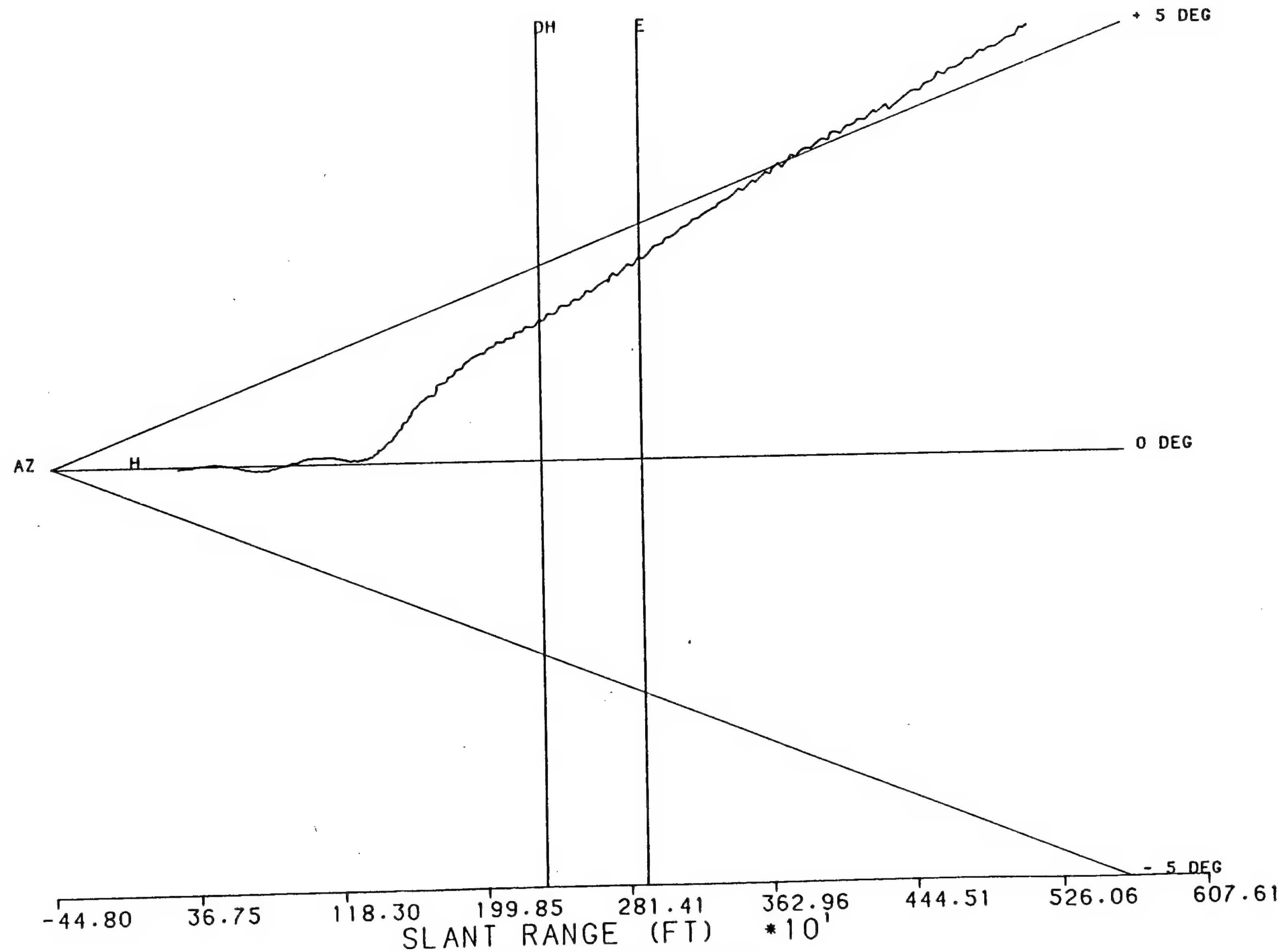

RUN # 1
6/22/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

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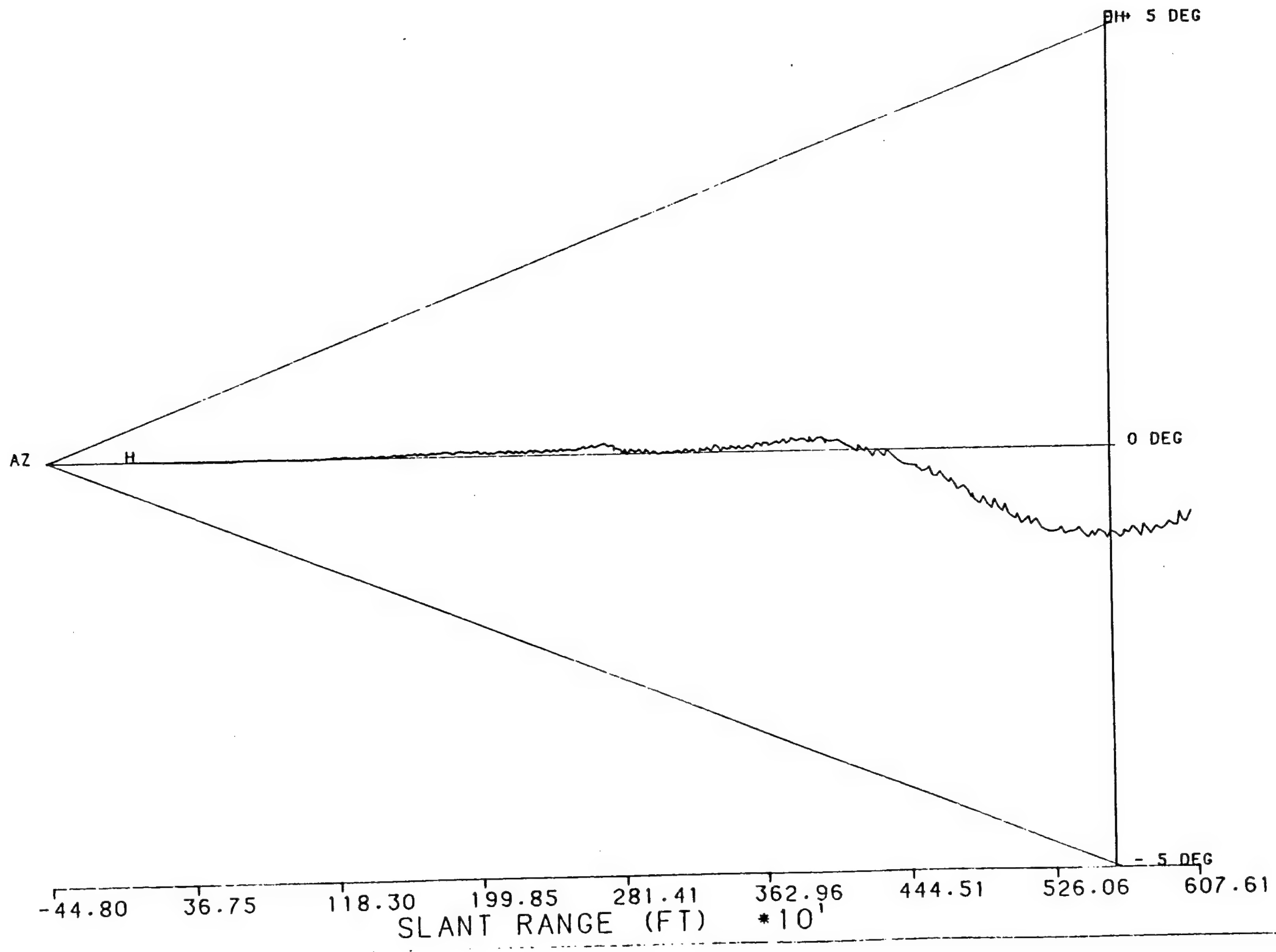

RUN # 2
6/22/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

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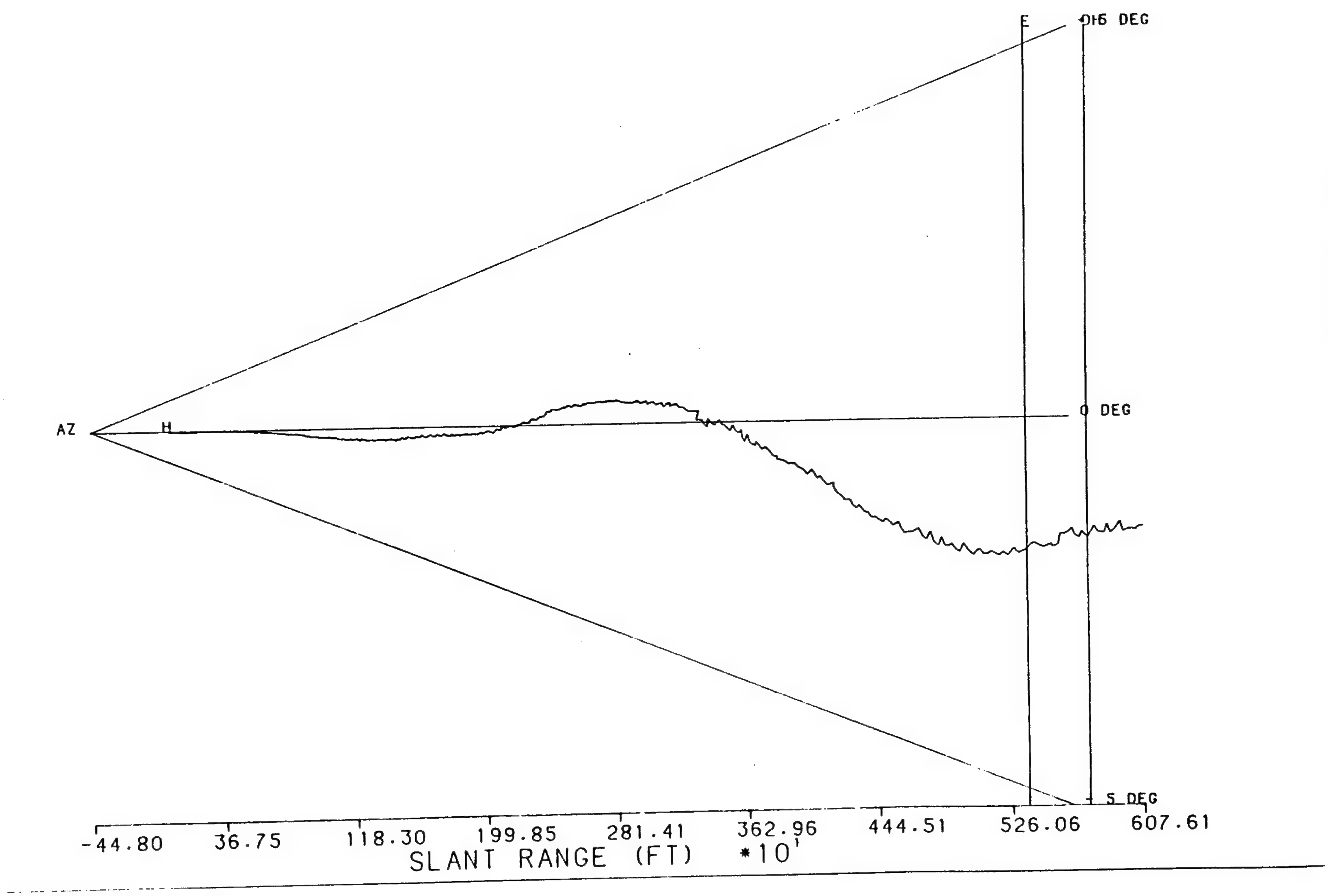

RUN # 3
6/22/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 5 DEGREE R AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

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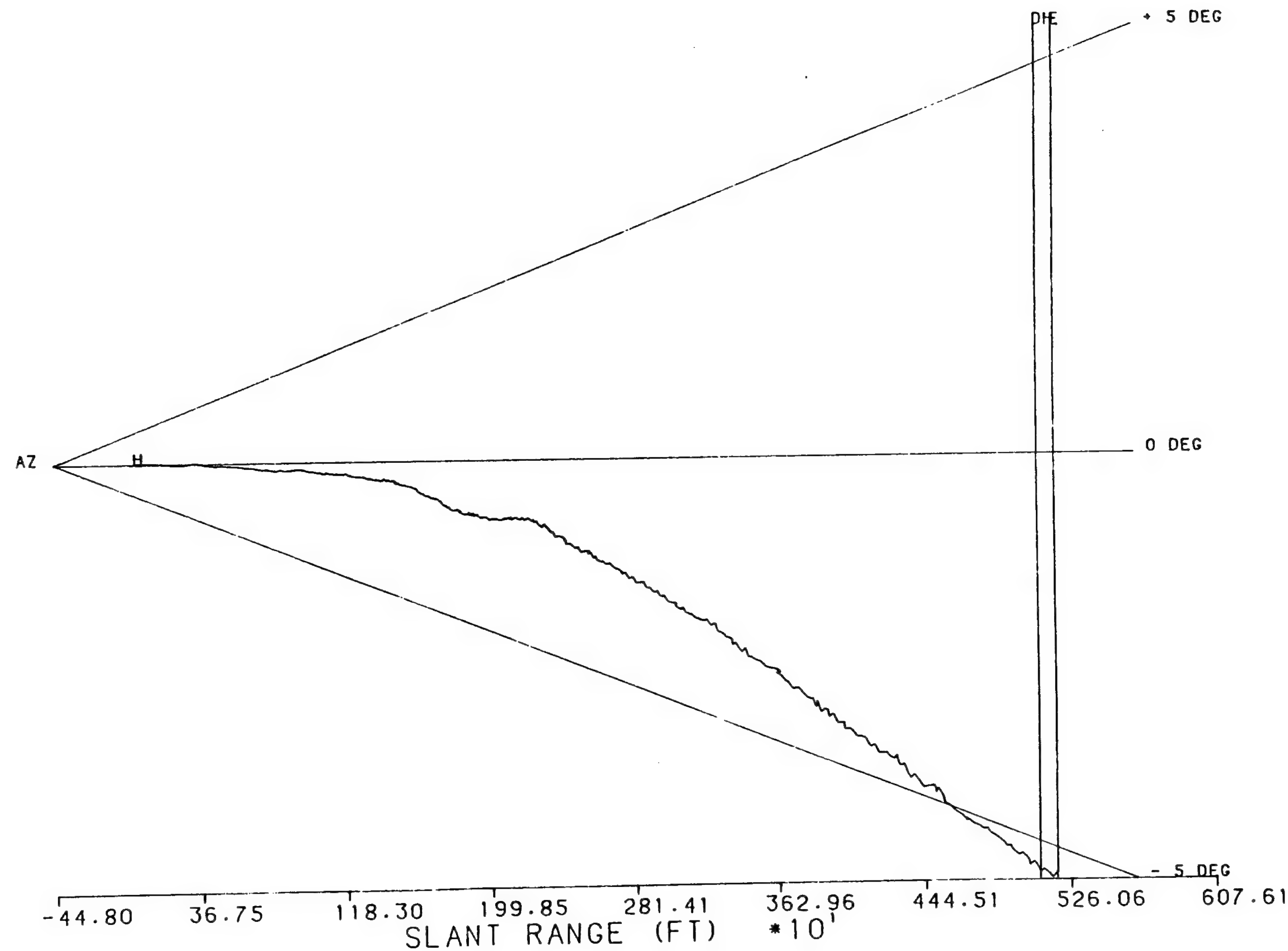
ATLANTIC CITY AIRPORT. N J 08405



RUN # 4
6/22/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 5 DEGREE L AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

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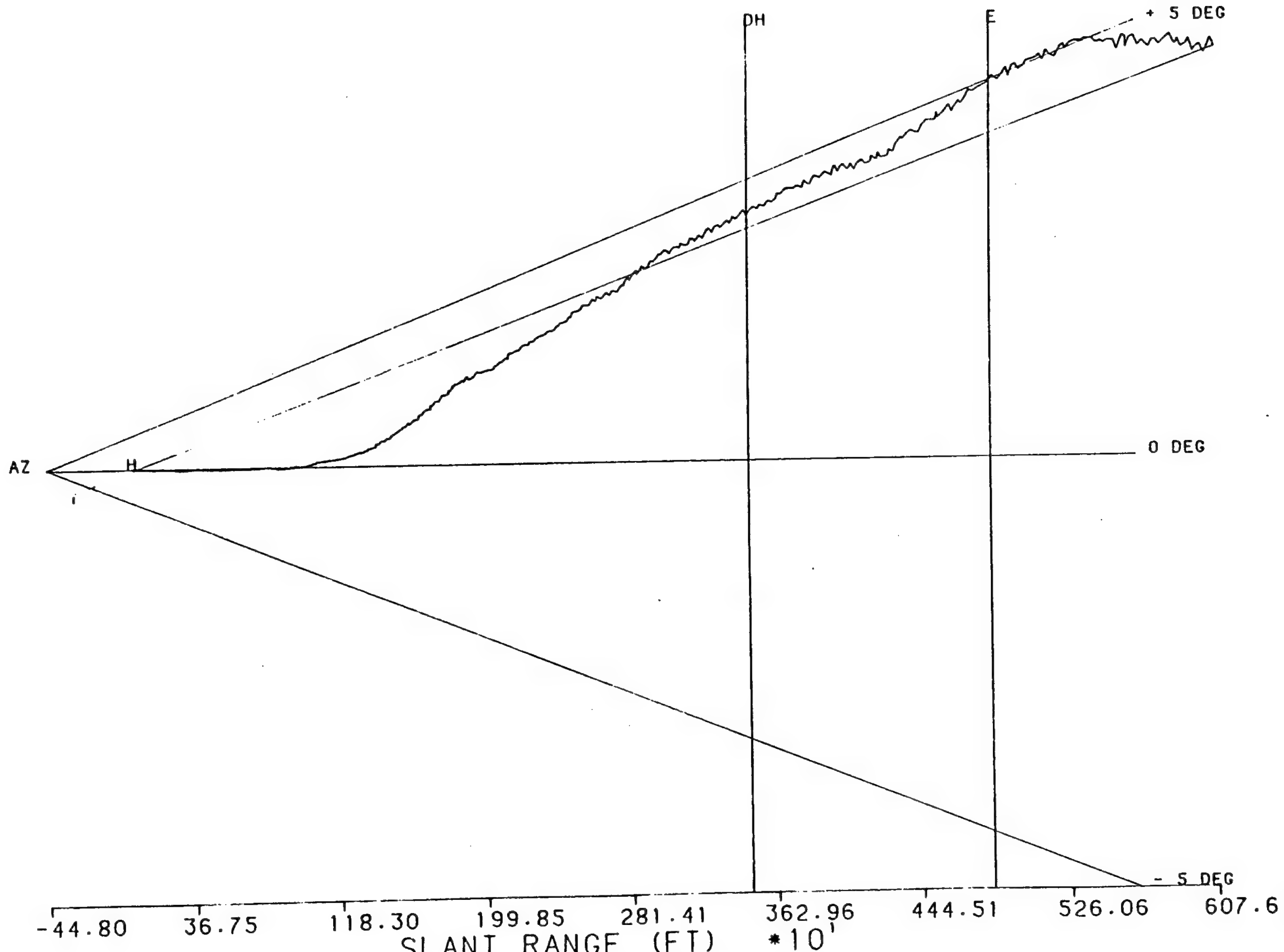

RUN # 5
6/22/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

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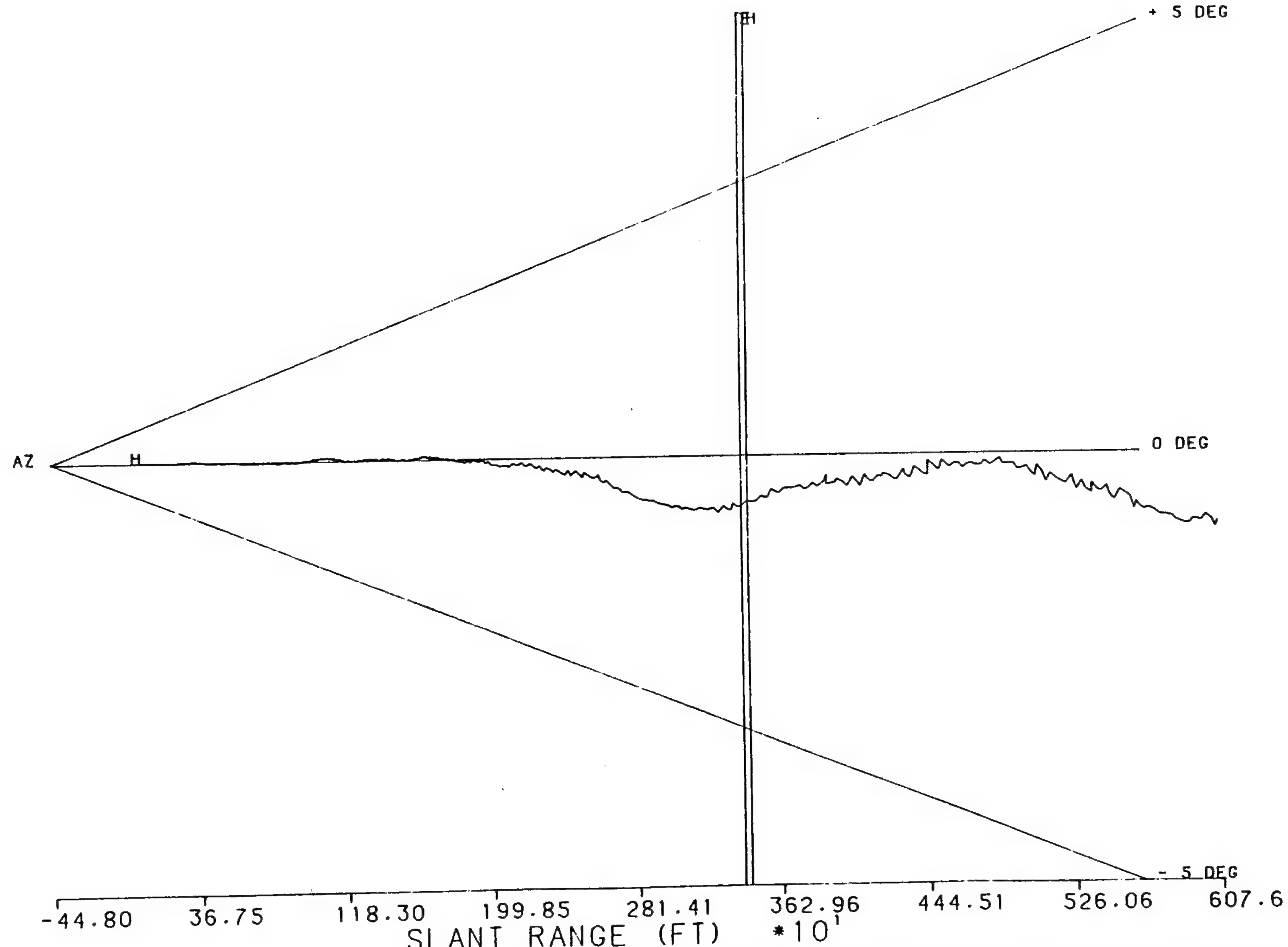
ATLANTIC CITY AIRPORT. N J 08405



RUN # 6

6/22/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE R AZ OFF

AZIMUTH : +- 0.00

ELEVATION : +- 4.50

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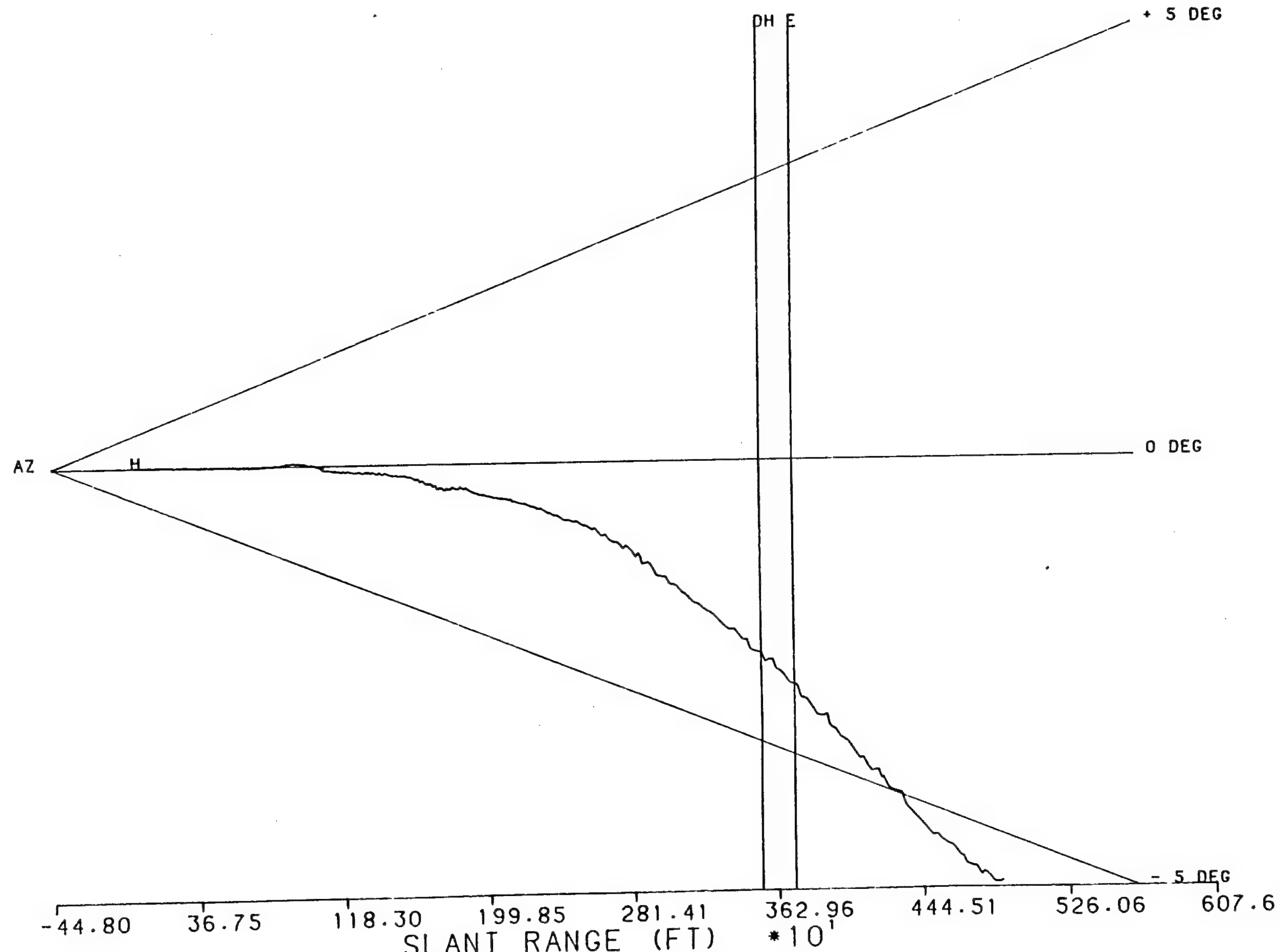

RUN # 7
6/22/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE L AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

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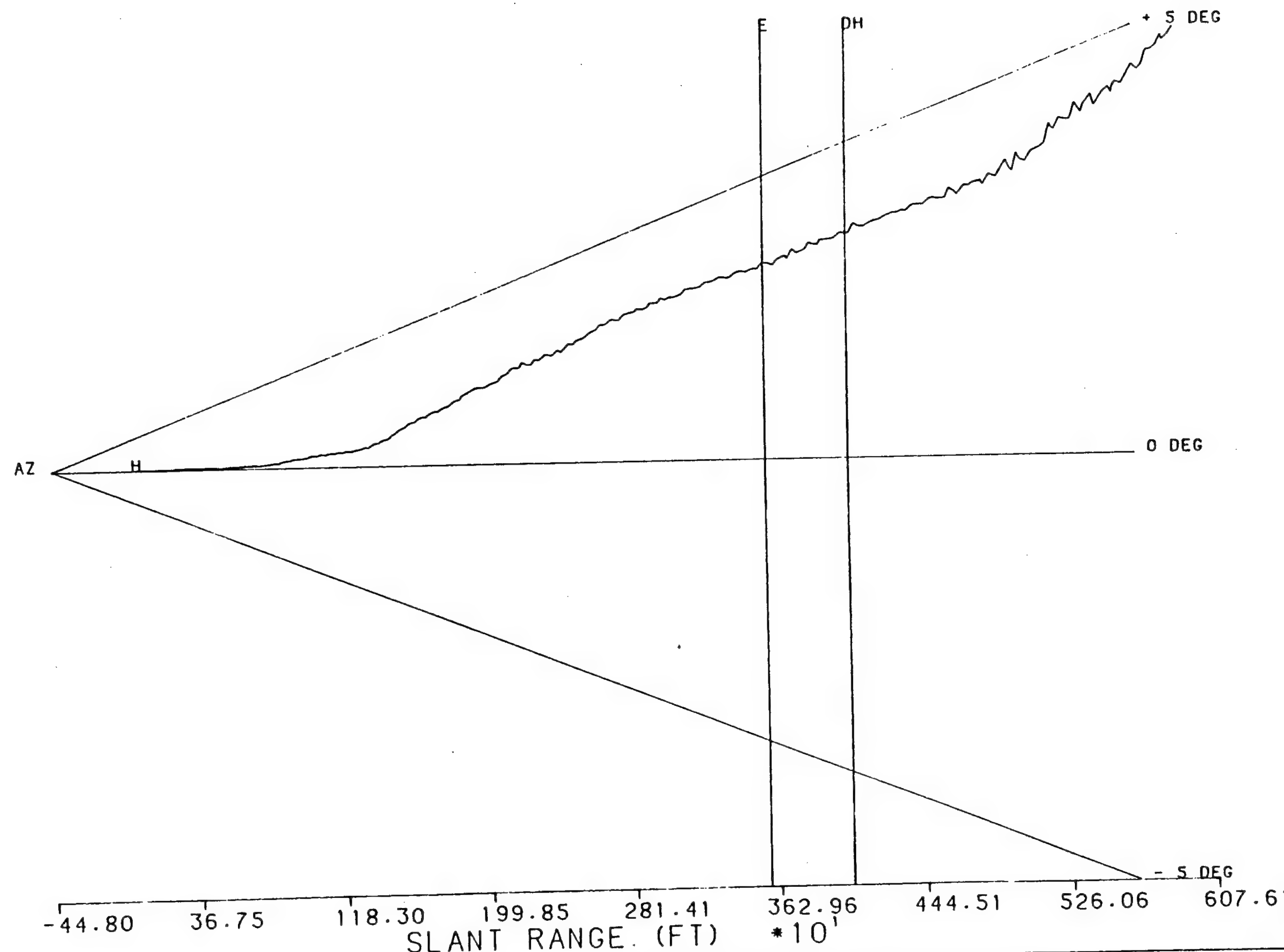

RUN # 8
6/22/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

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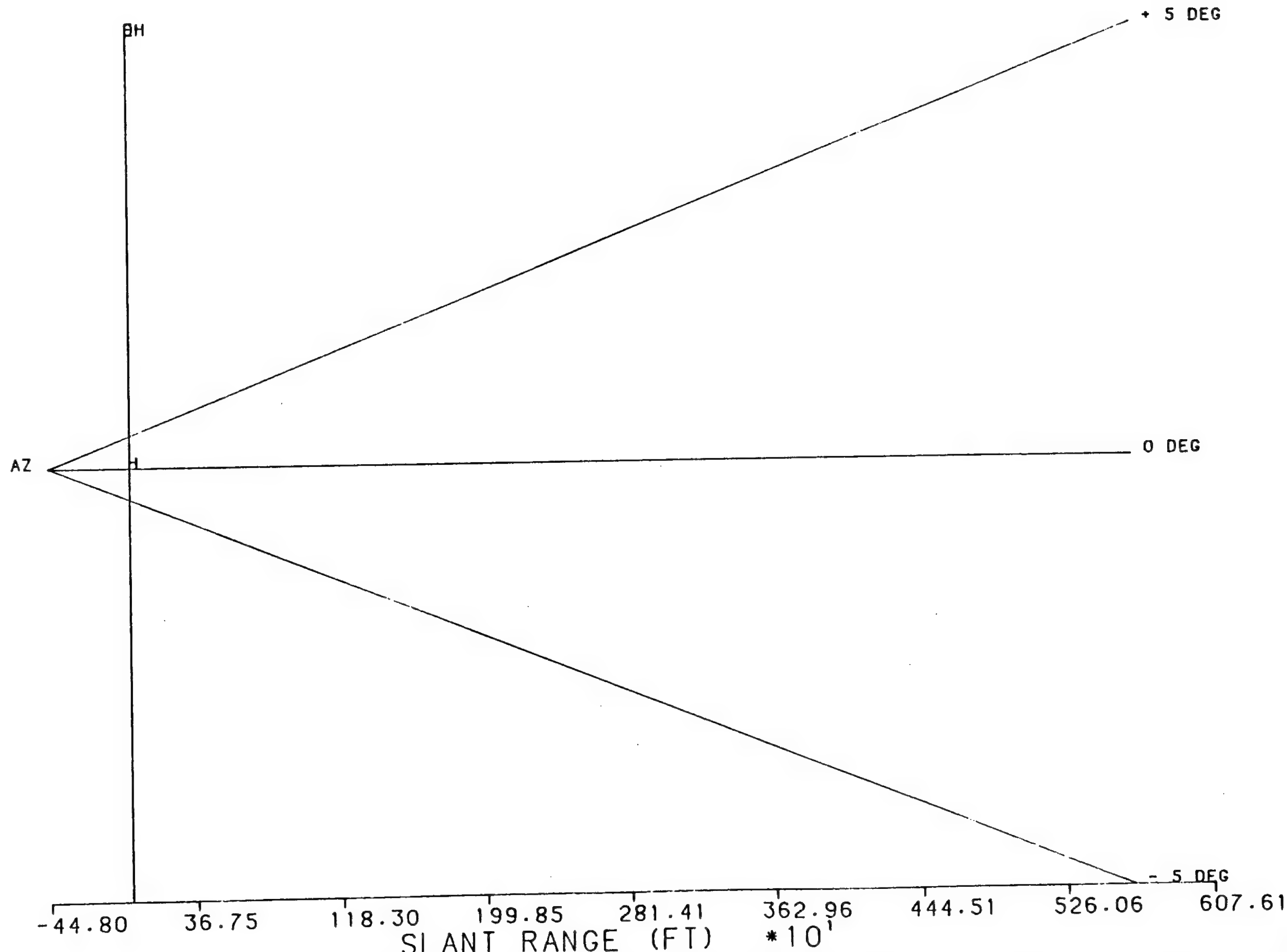

RUN # 1
6/9/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

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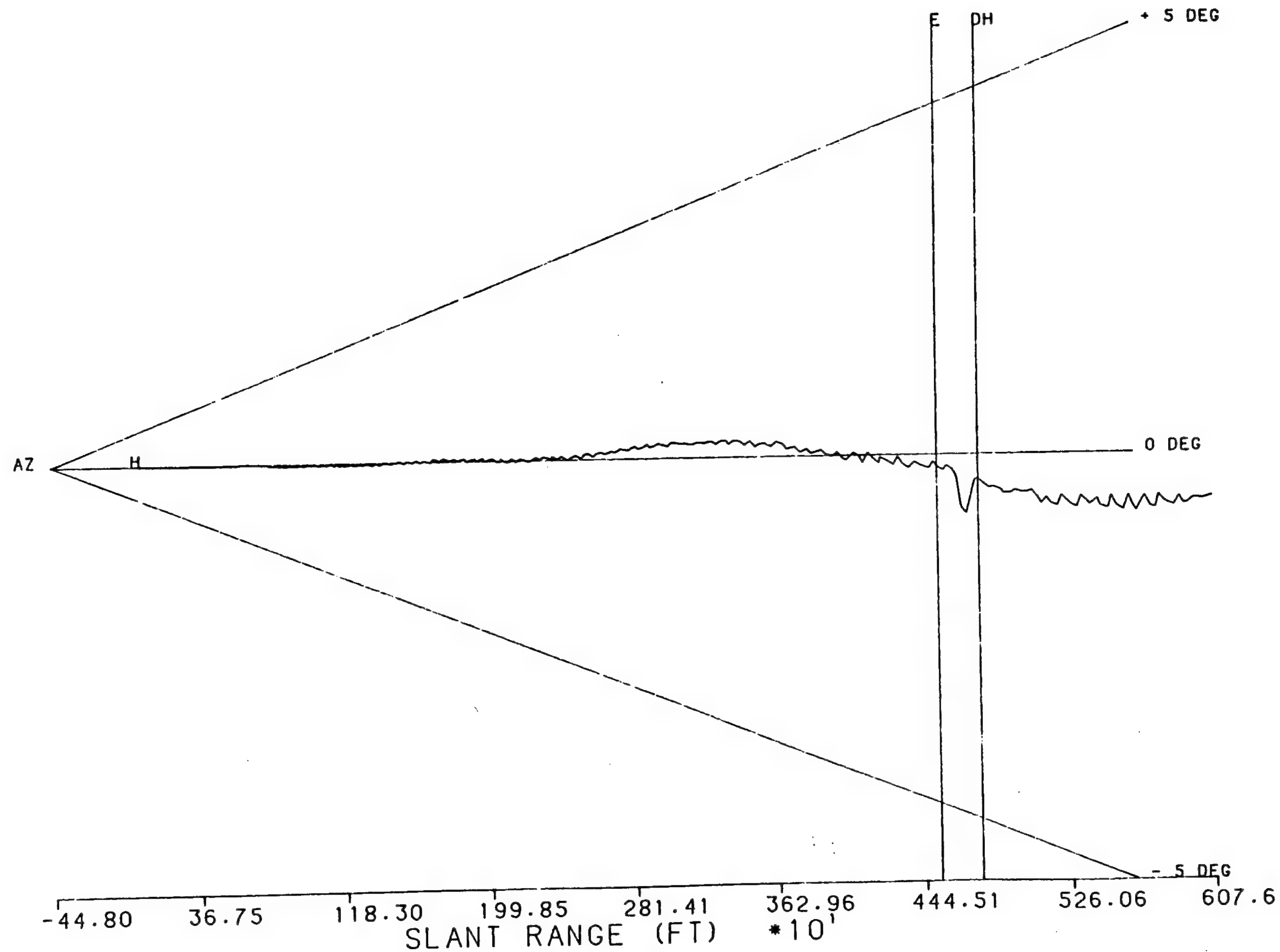
ATLANTIC CITY AIRPORT, N J 08405



RUN # 2
6/9/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

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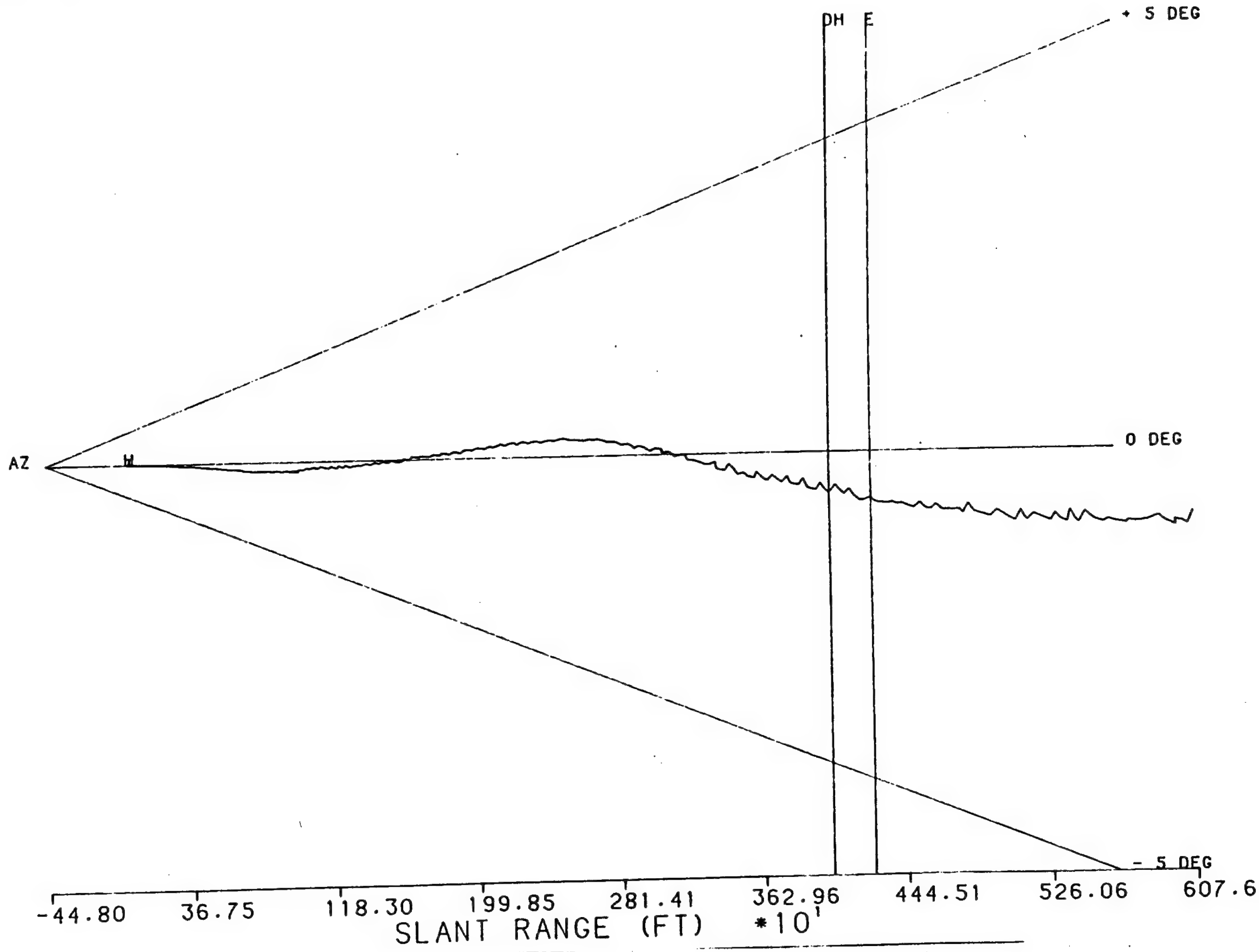
ATLANTIC CITY AIRPORT, N J 08405



RUN # 3
6/9/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 5 DEGREE R AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

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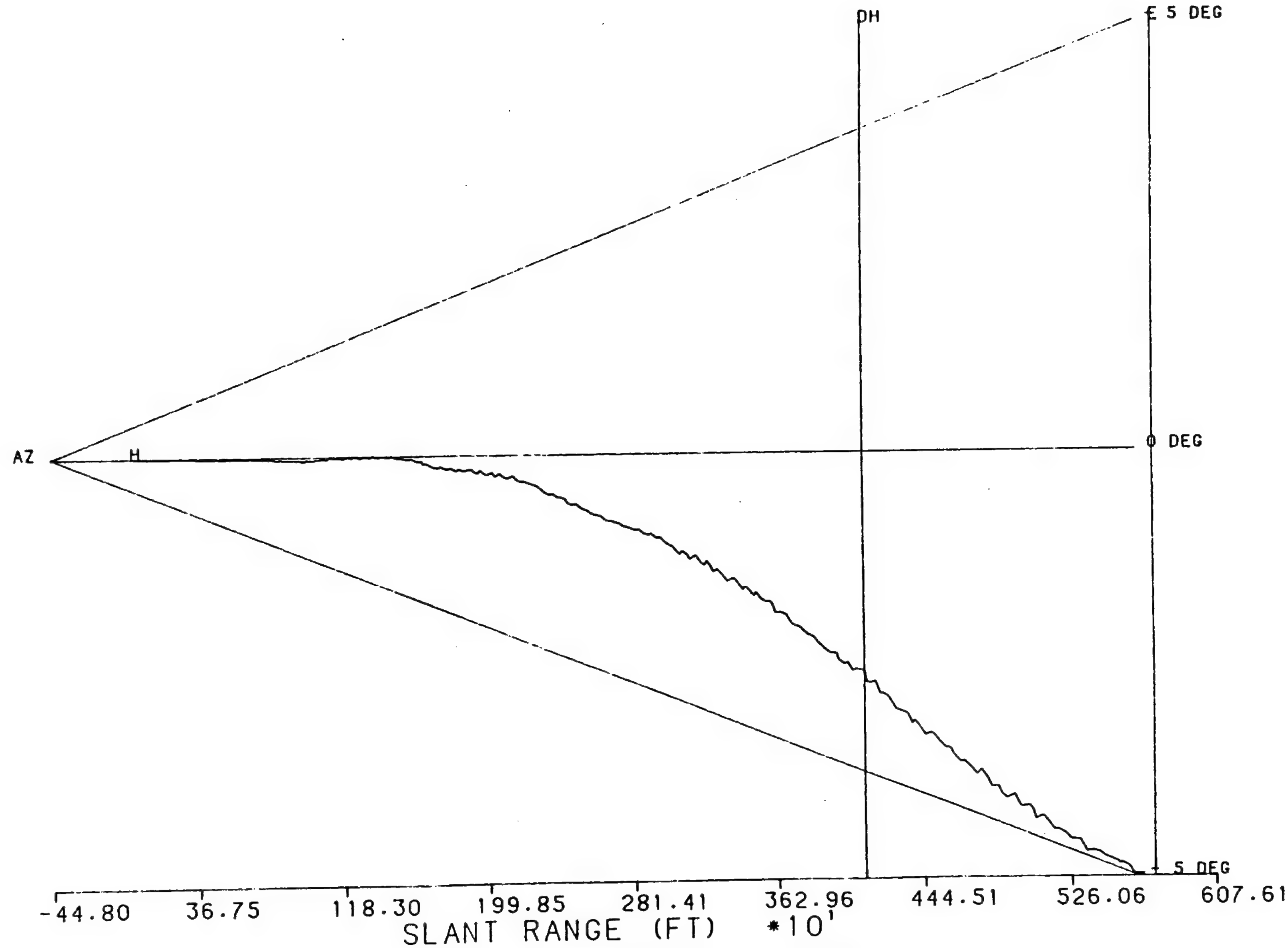

RUN # 4
6/9/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 5 DEGREE L AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

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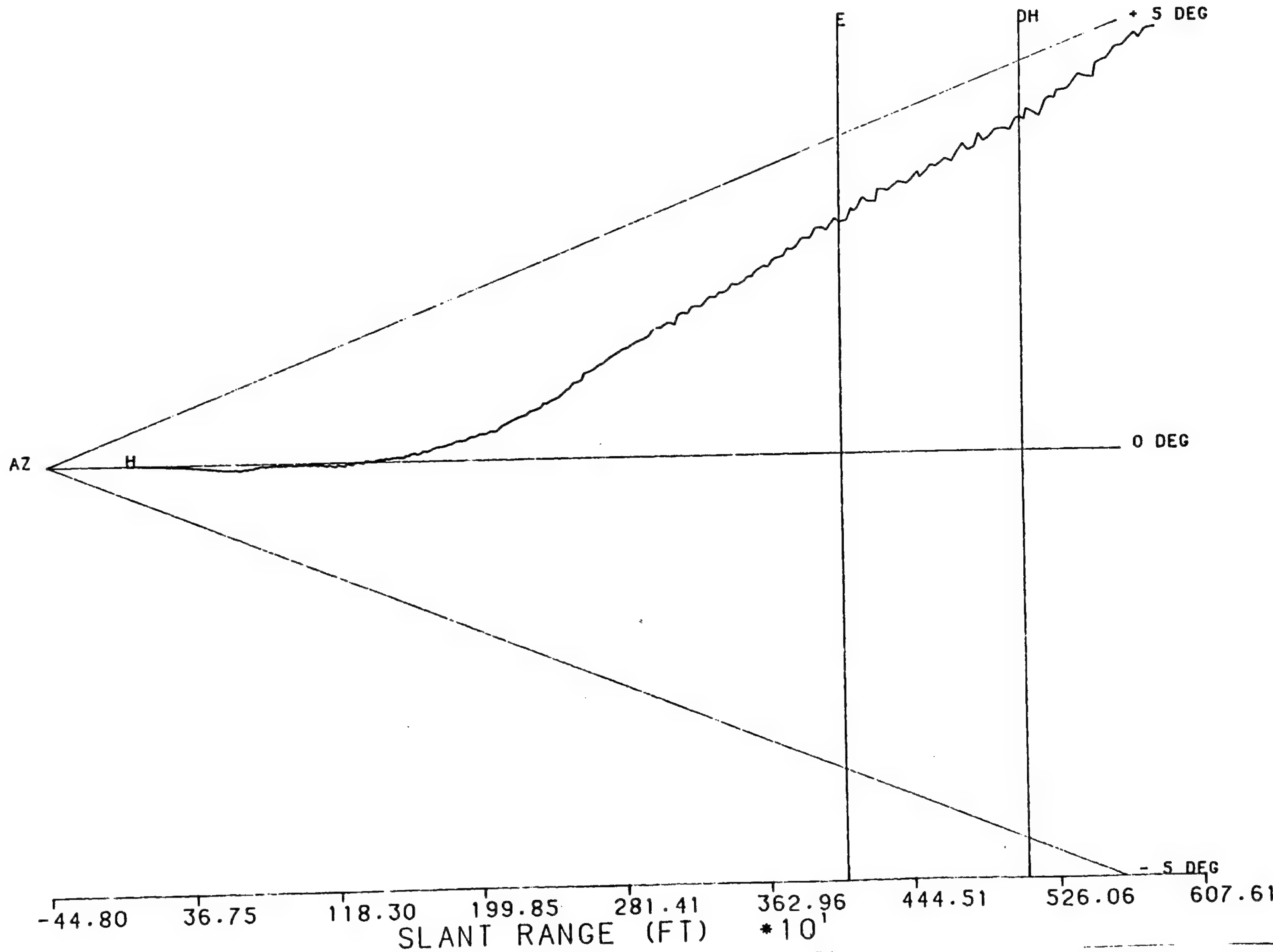

RUN # 5
6/9/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

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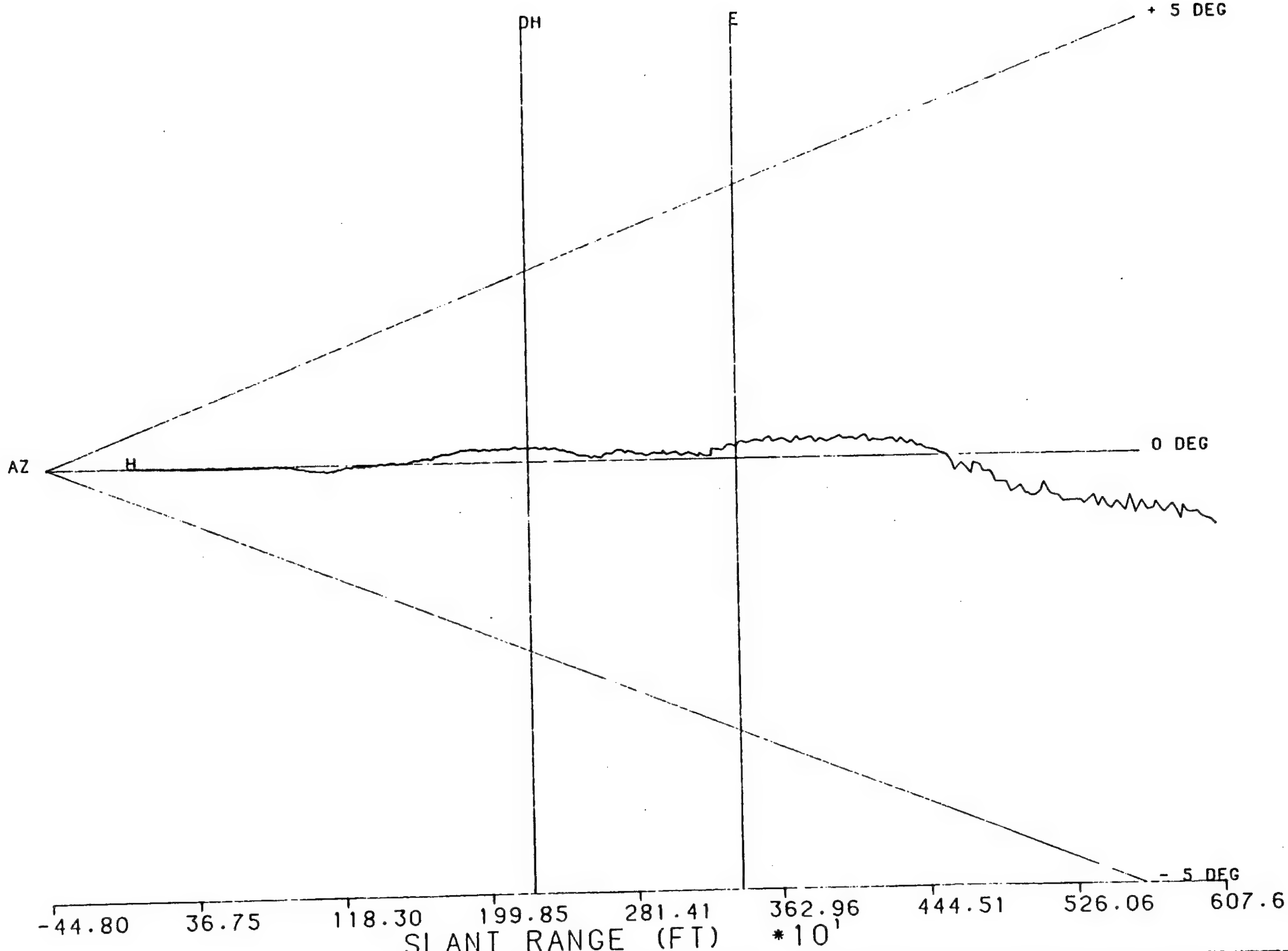

RUN # 6
6/9/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE R AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

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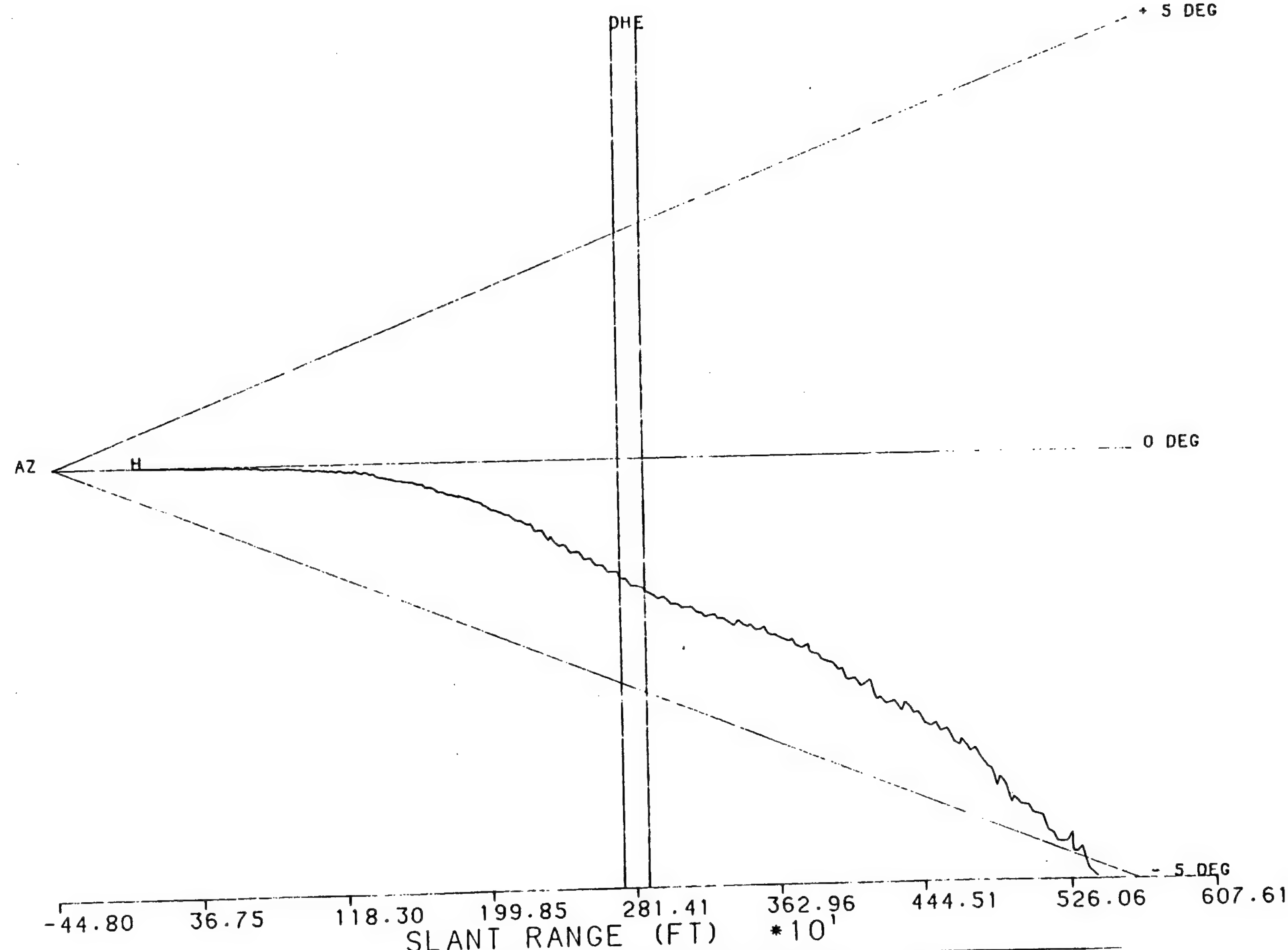

RUN # 7
6/9/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE L AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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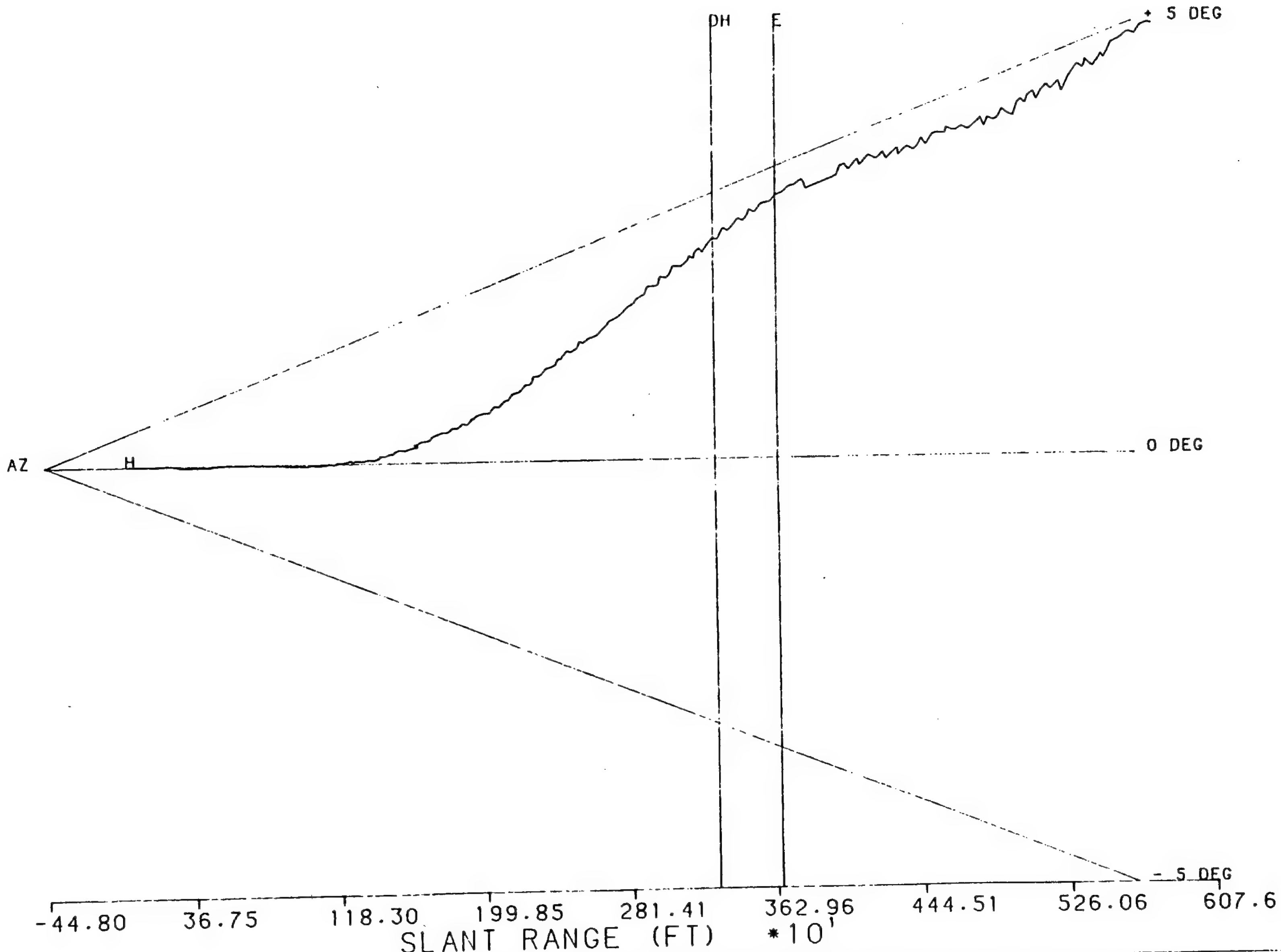

RUN # 8
6/9/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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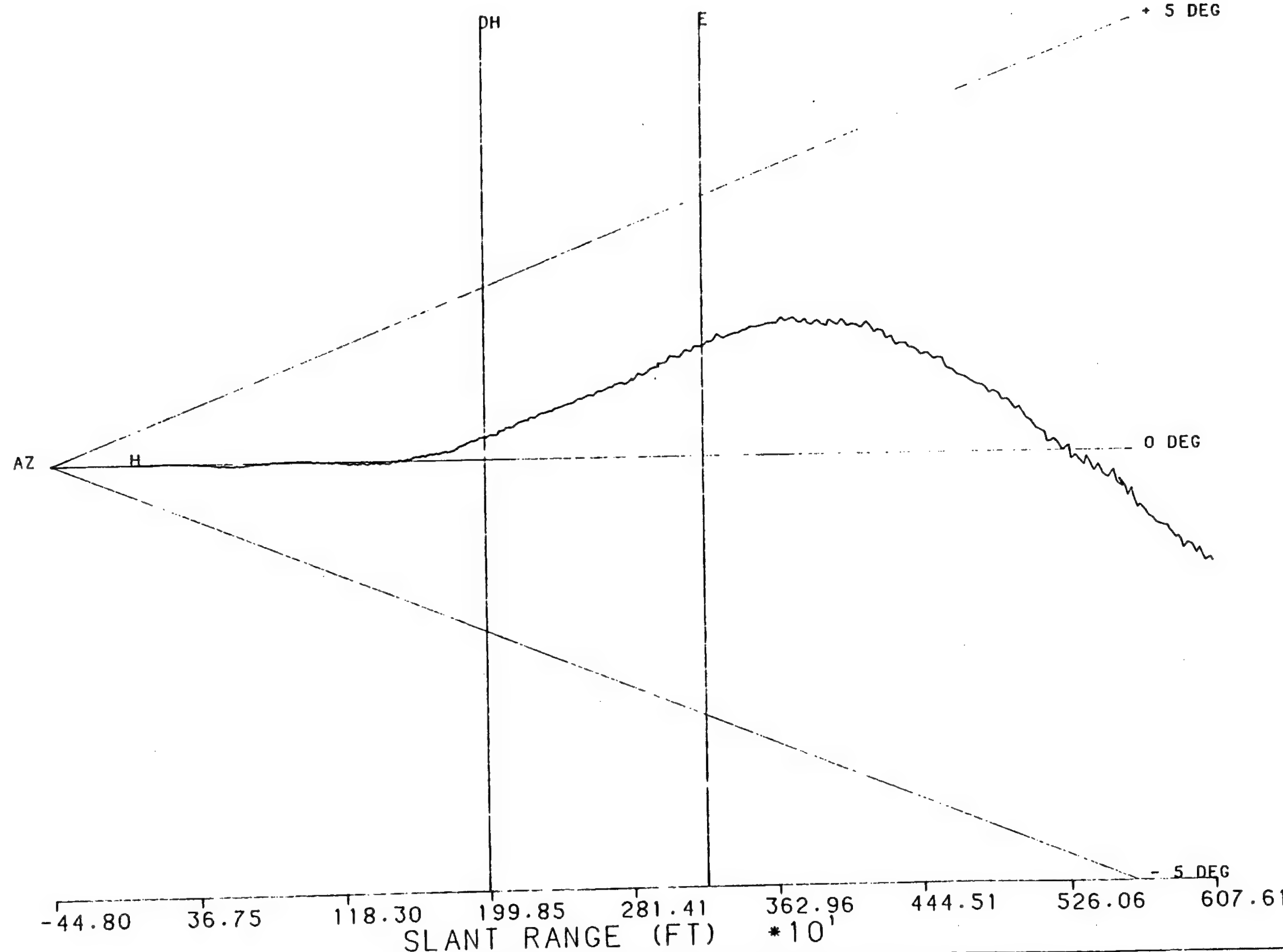

RUN # 9
6/9/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 5 DEGREE R AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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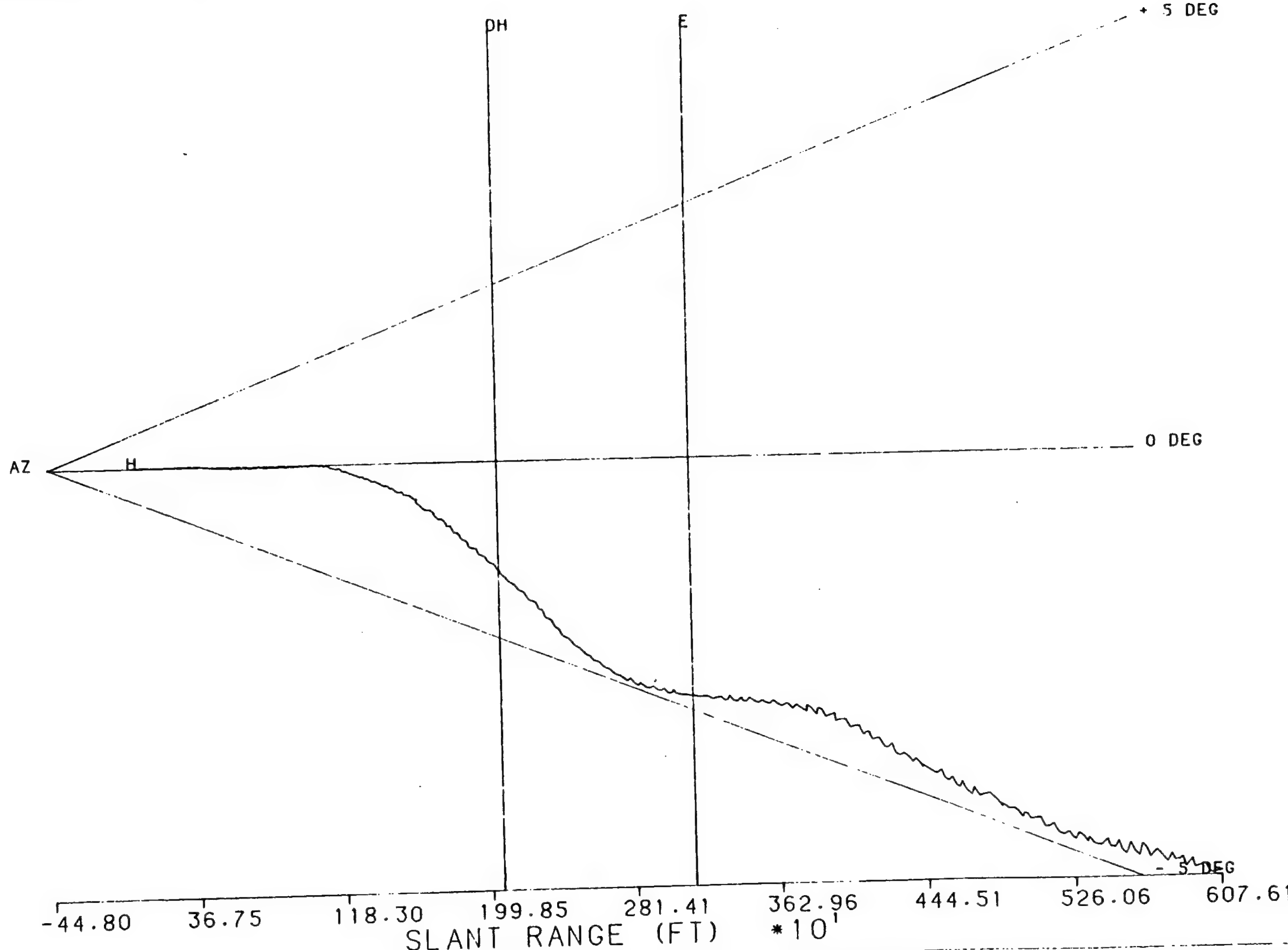

RUN # 10
6/9/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 5 DEGREE L AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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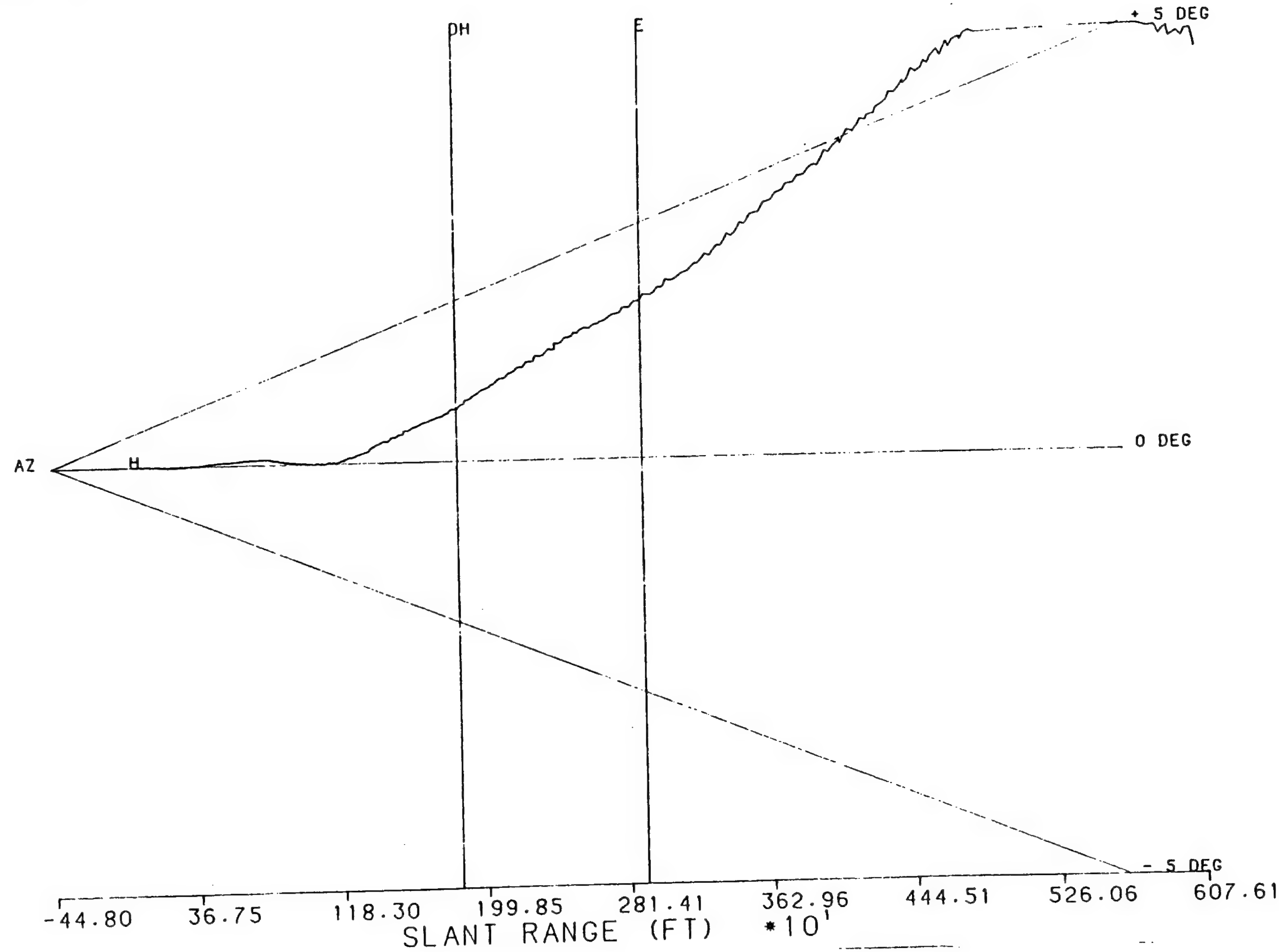

RUN # 1
6/8/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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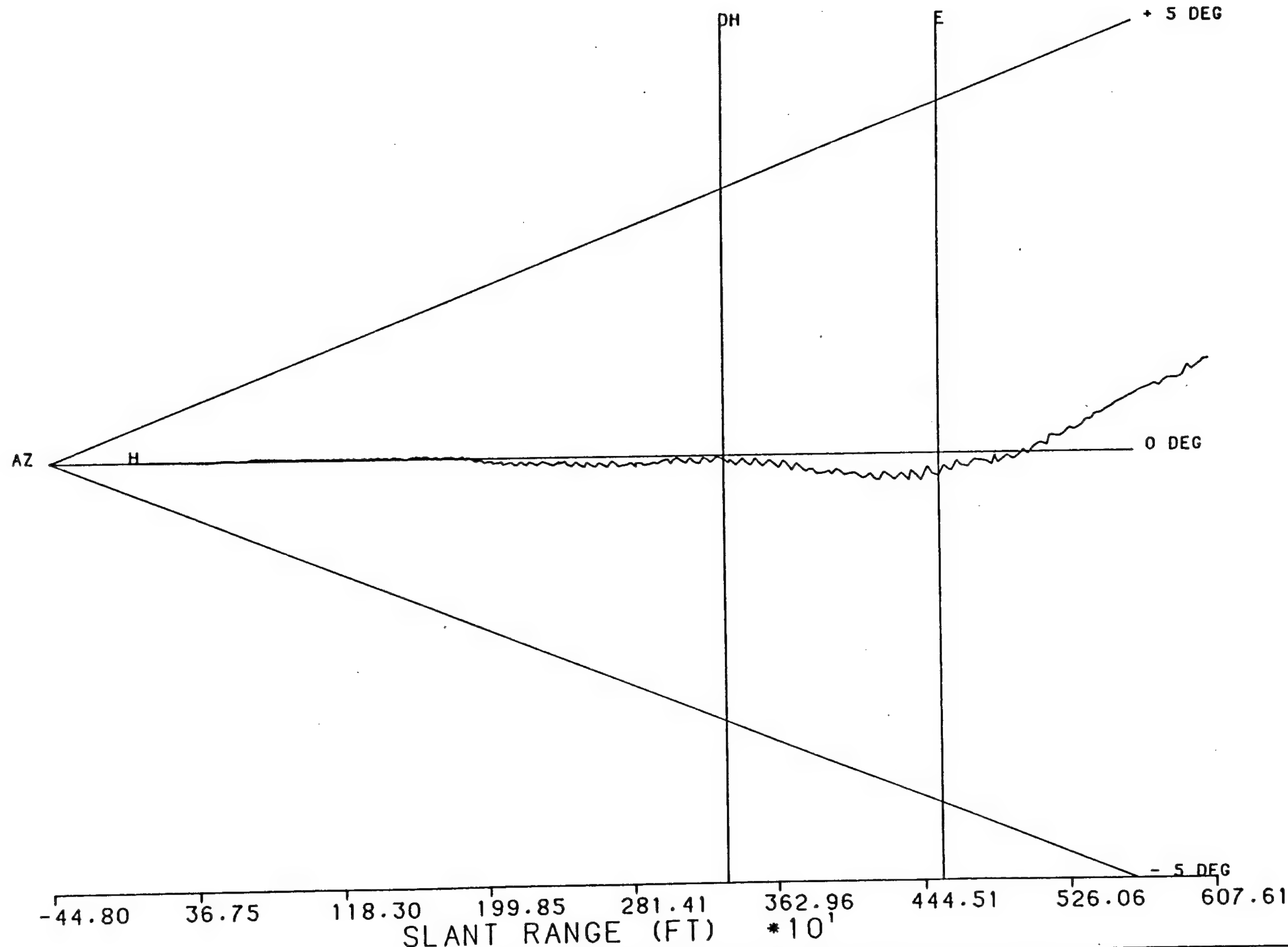

RUN # 2
6/8/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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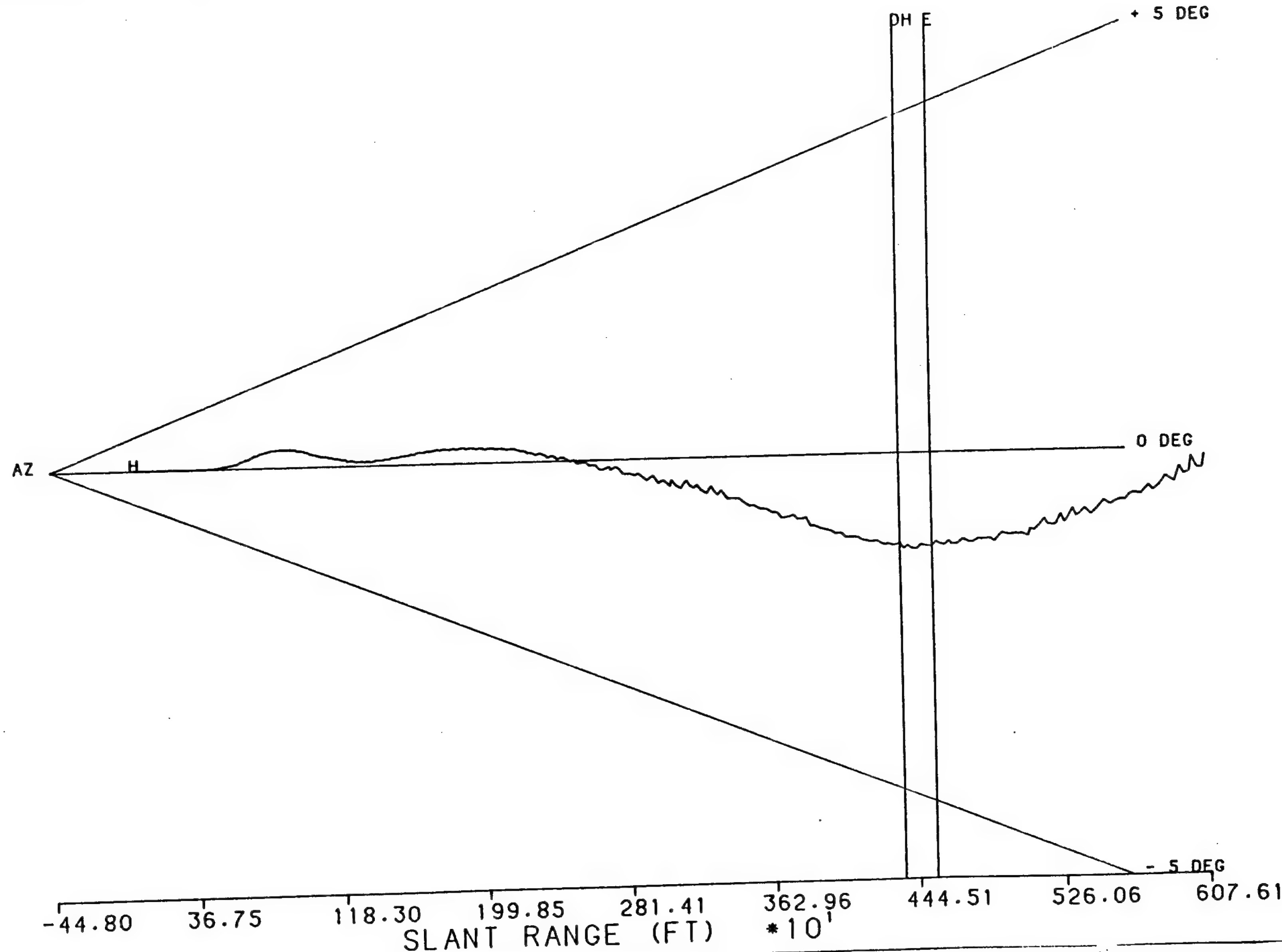

RUN # 3
6/8/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 5 DEGREE R AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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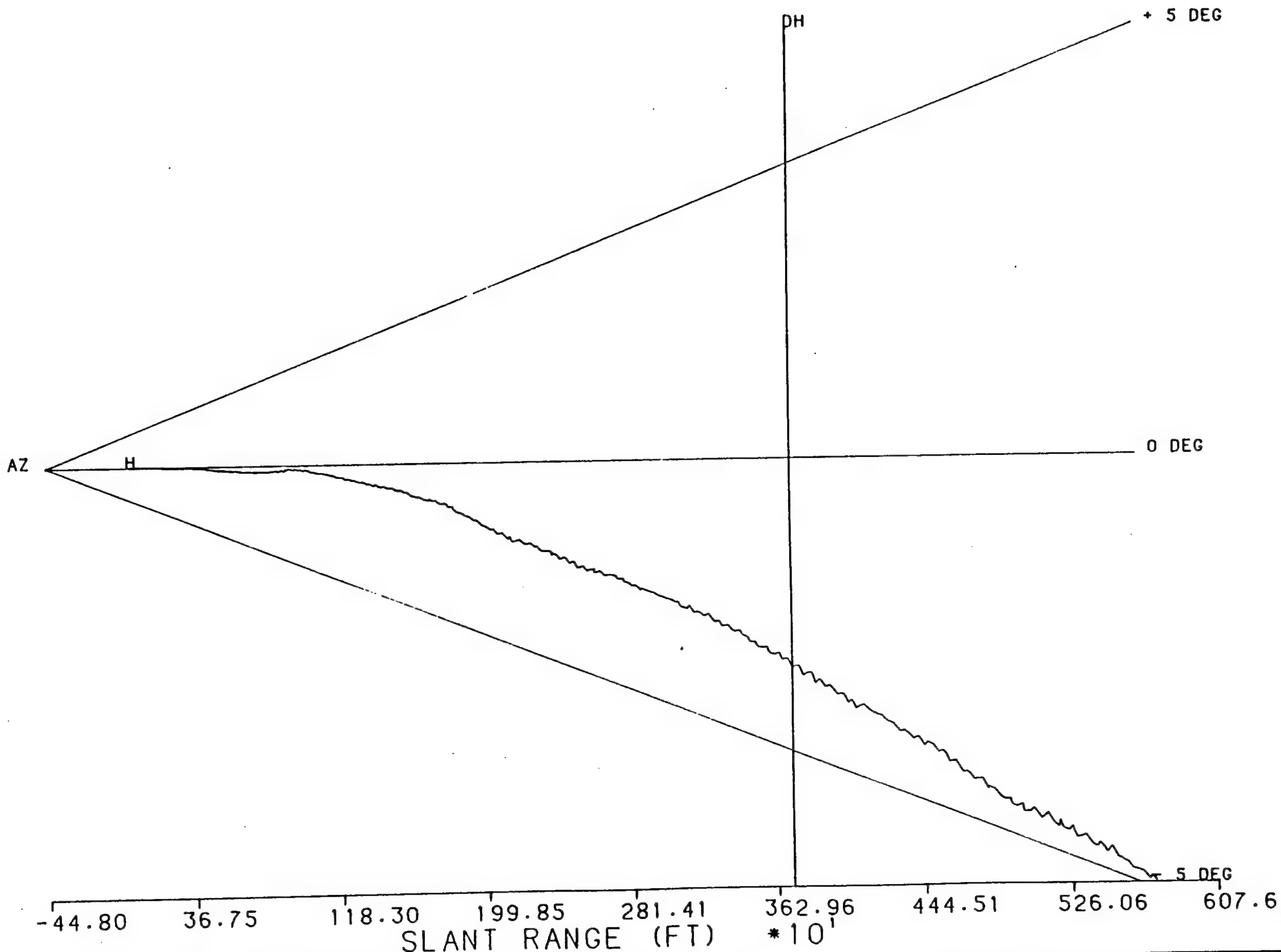

RUN # 4
6/8/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 5 DEGREE L AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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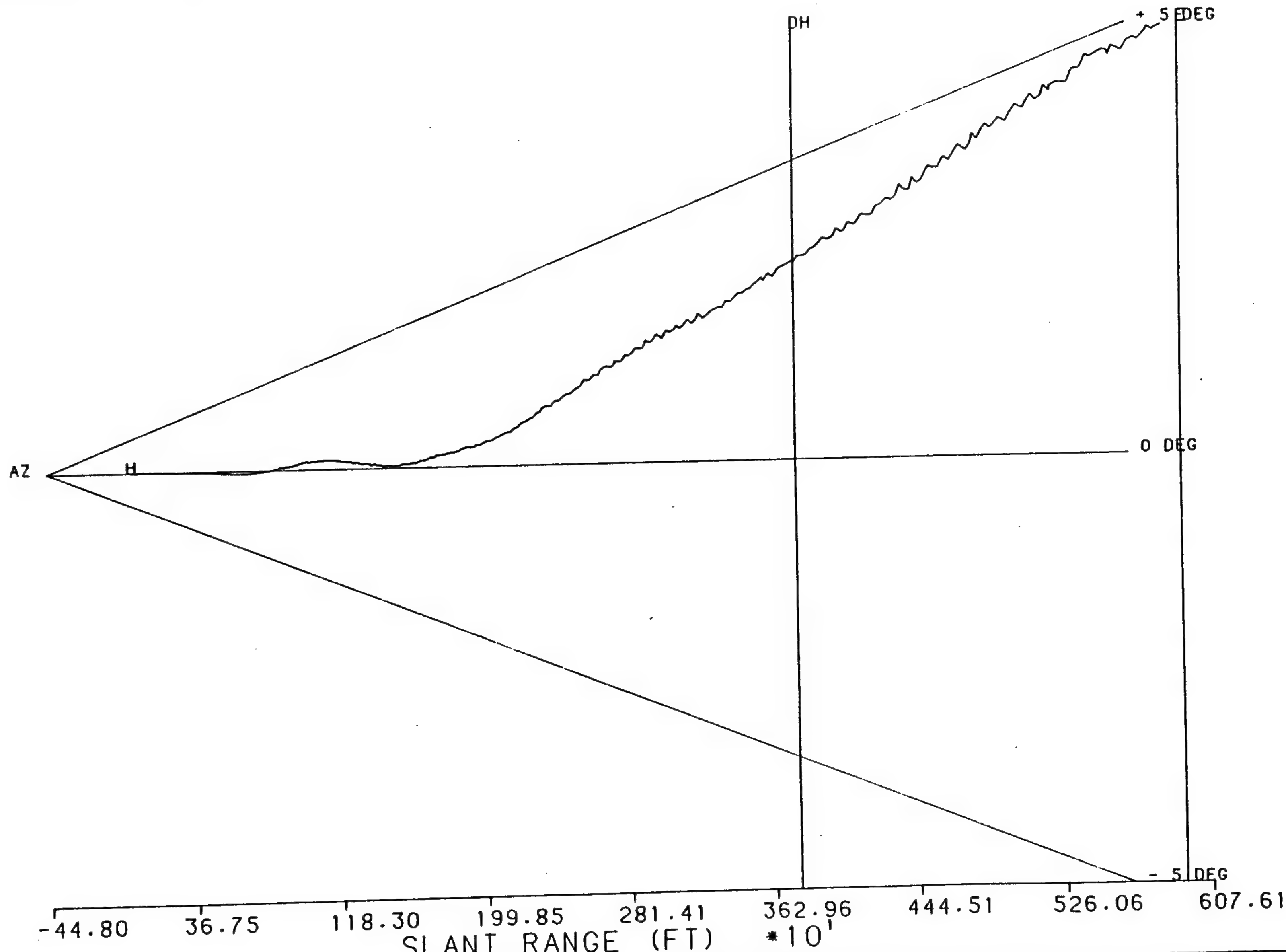

RUN # 5
6/8/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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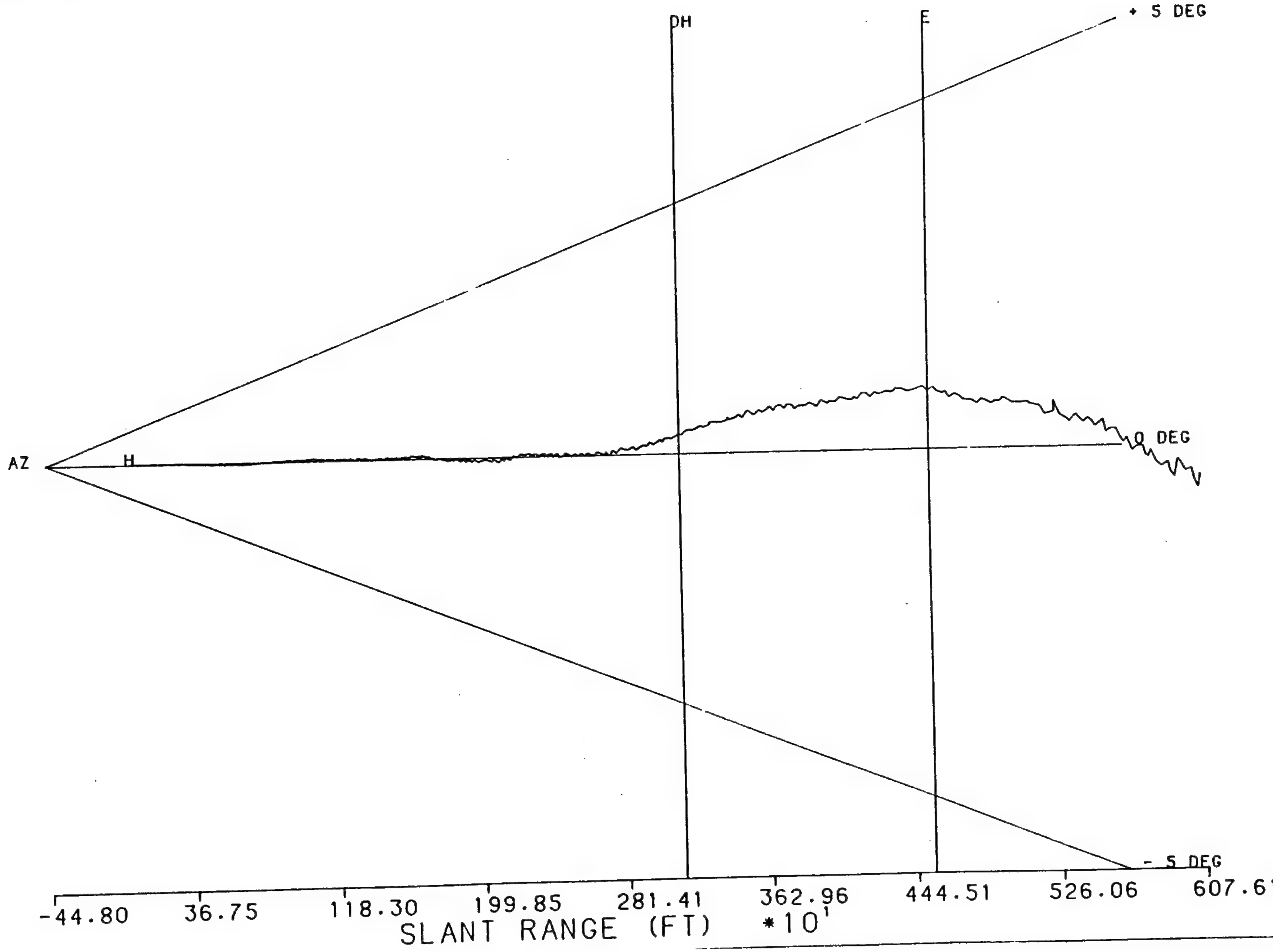

RUN # 6
6/8/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE R AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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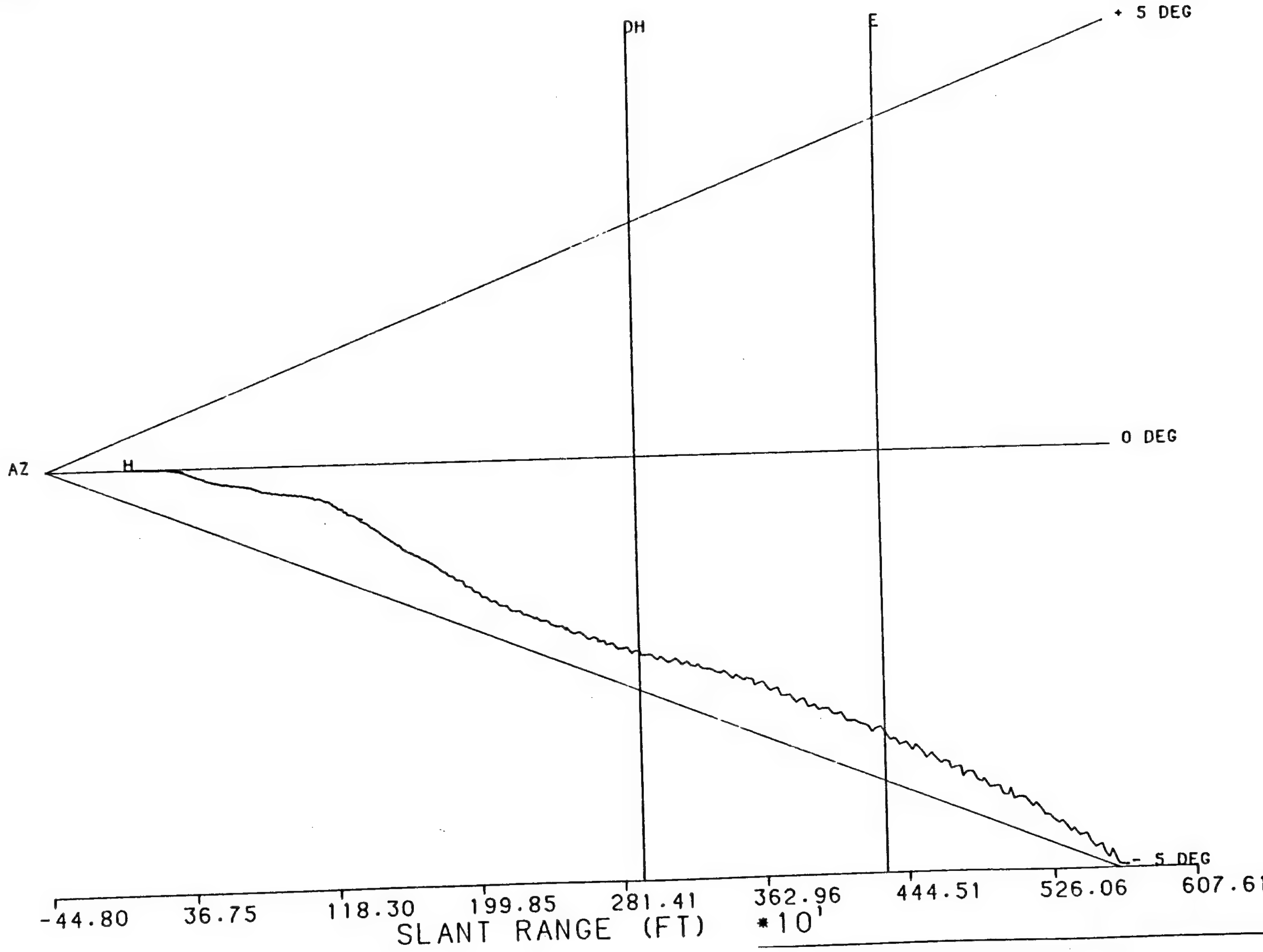

RUN # 7
6/8/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE L AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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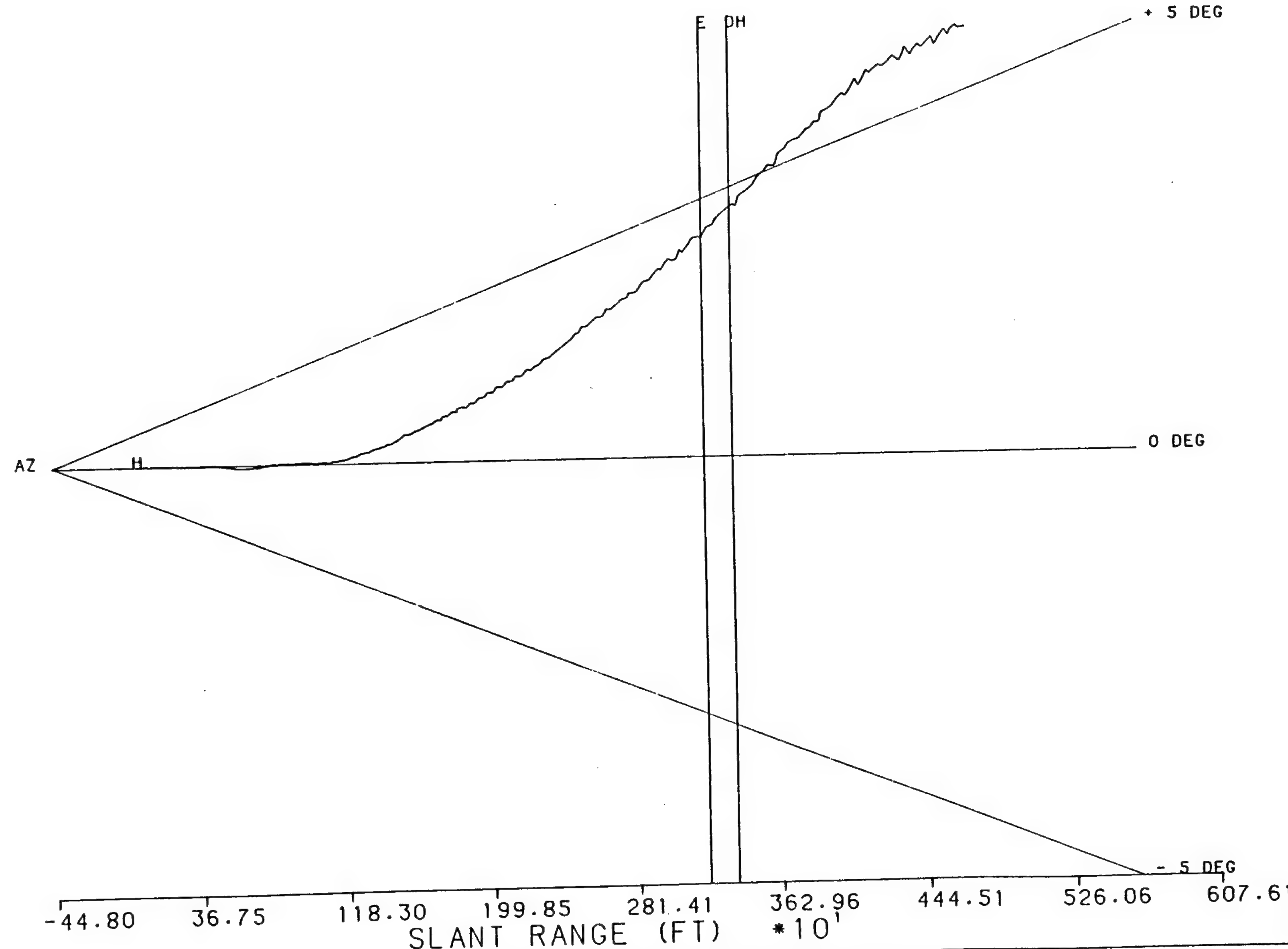

RUN # 8

6/8/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 0 DEGREE AZ ON

AZIMUTH : +- 0.00

ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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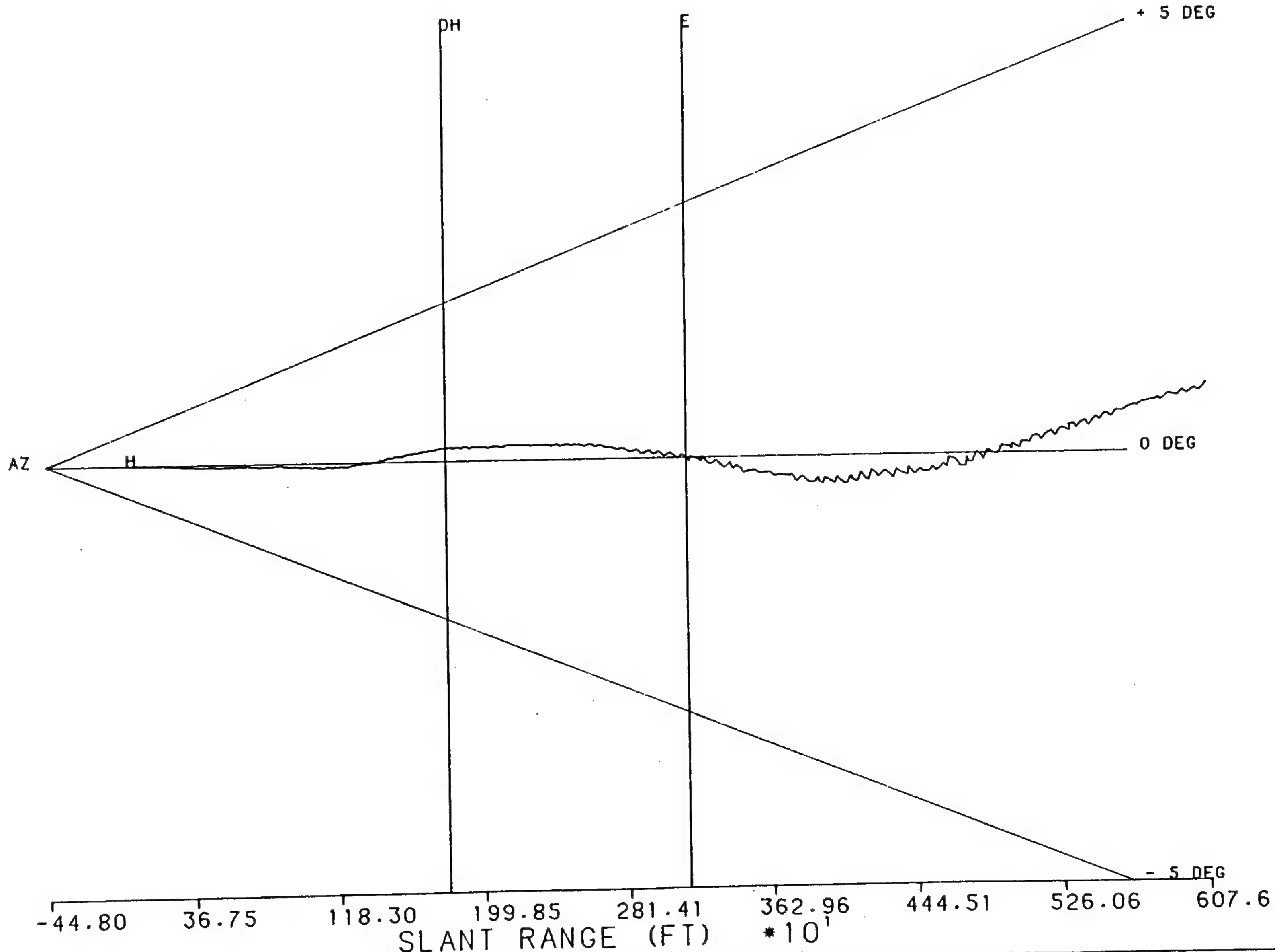

RUN # 9
6/8/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 5 DEGREE R AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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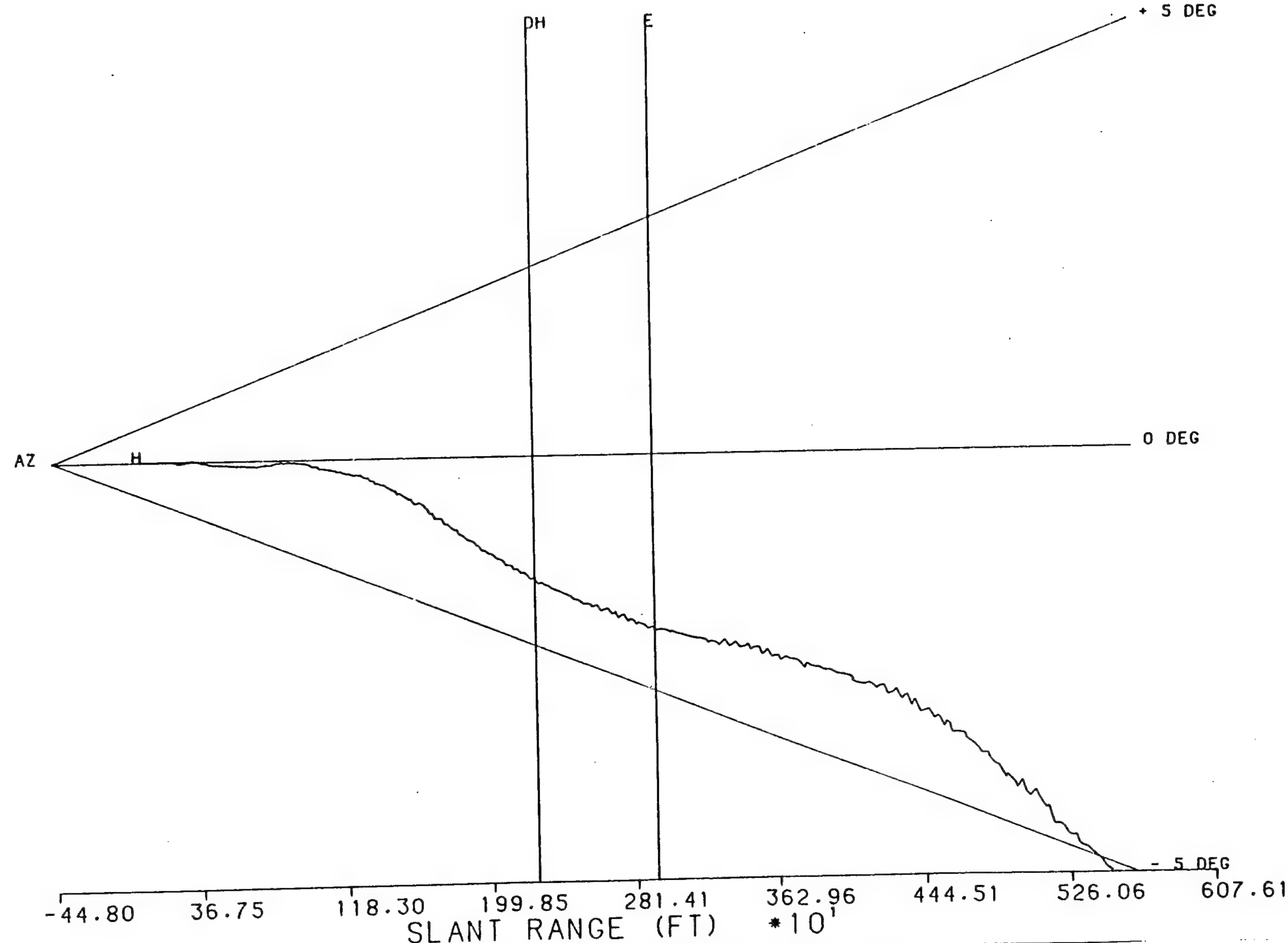

RUN # 10

6/8/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 5 DEGREE L AZ OFF

AZIMUTH : +- 0.00

ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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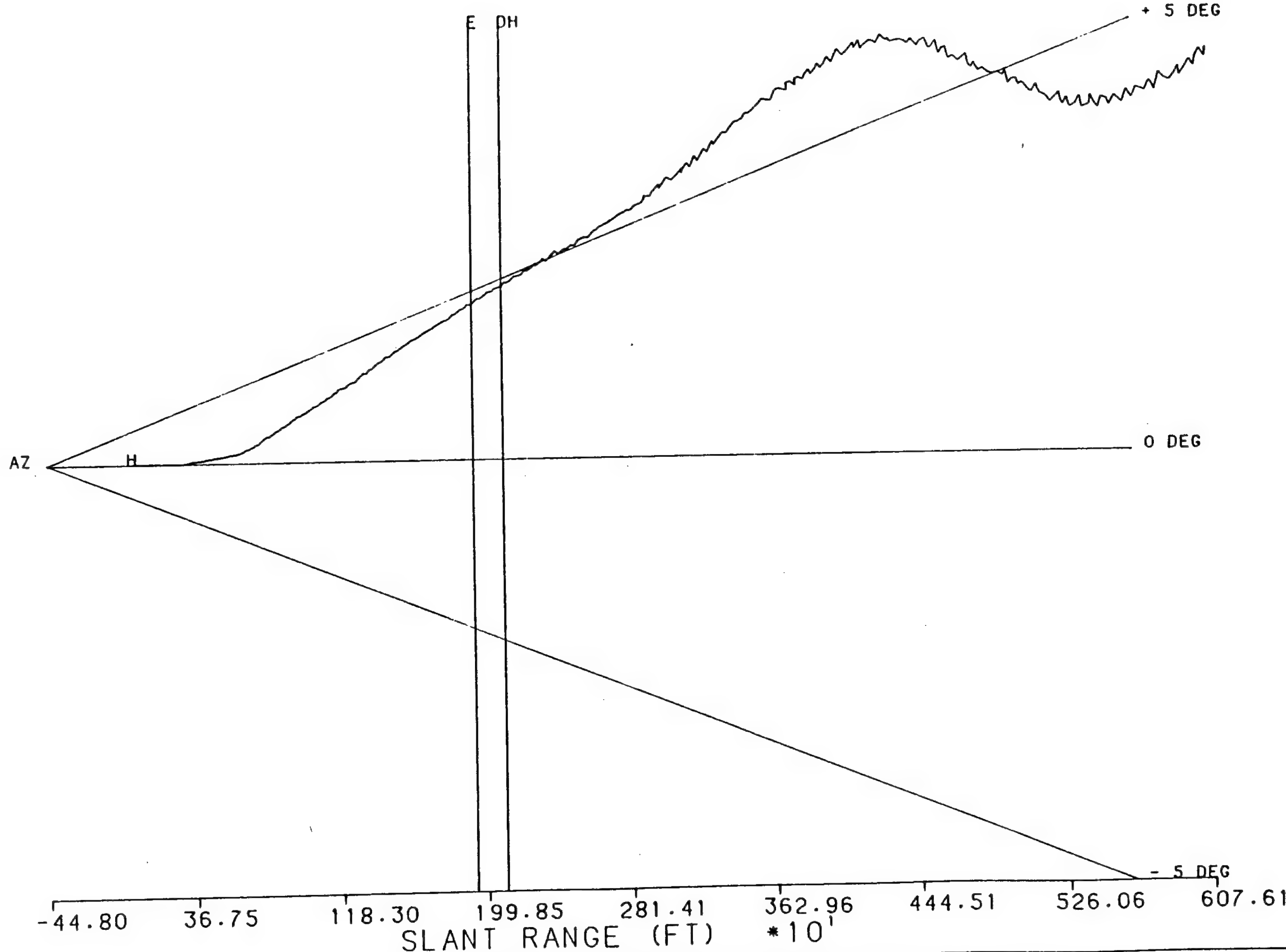

RUN # 1
6/6/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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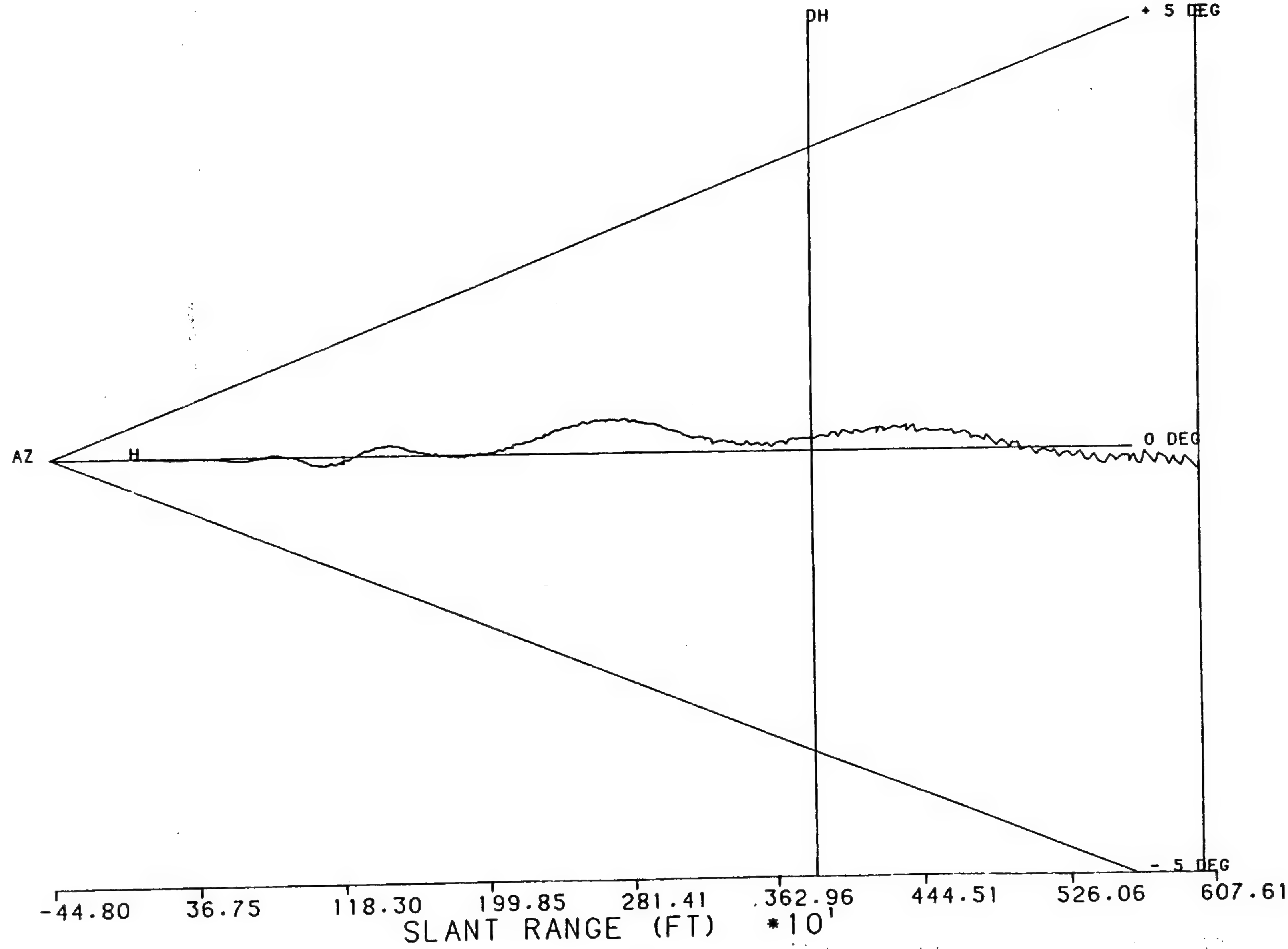

RUN # 2
6/6/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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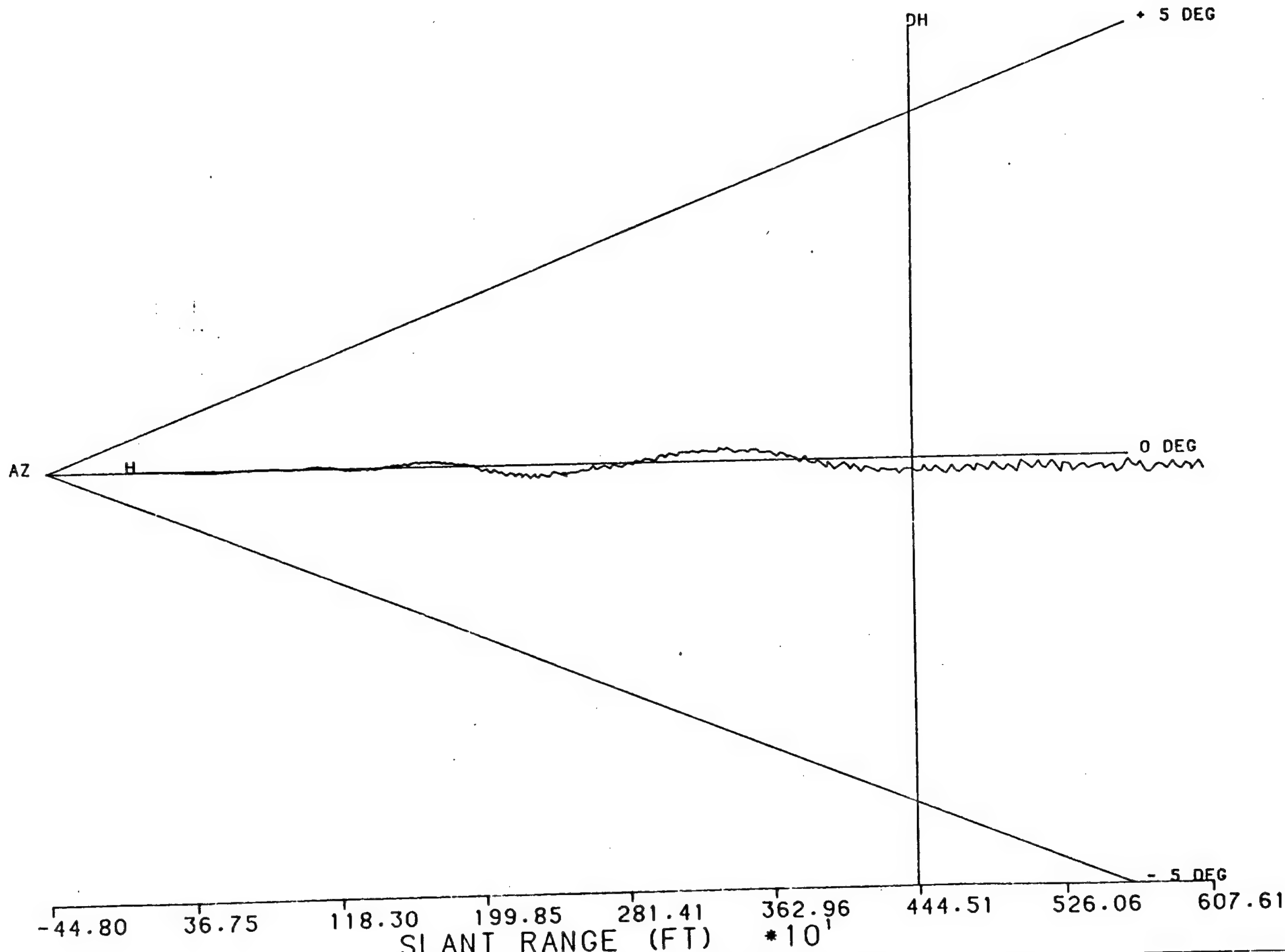
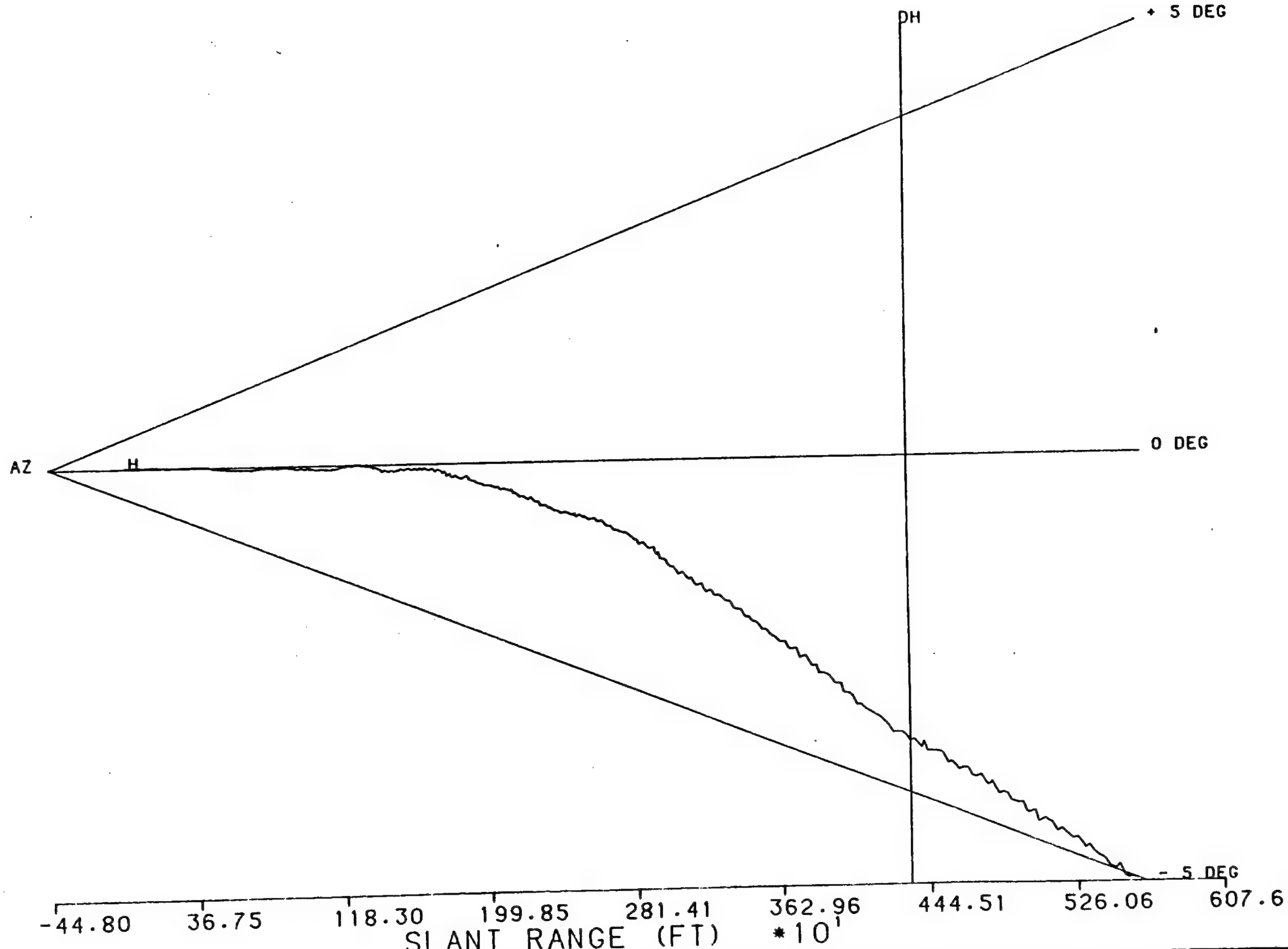


RUN # 3
6/6/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 5 DEGREE R AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 4
6/6/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 5 DEGREE L AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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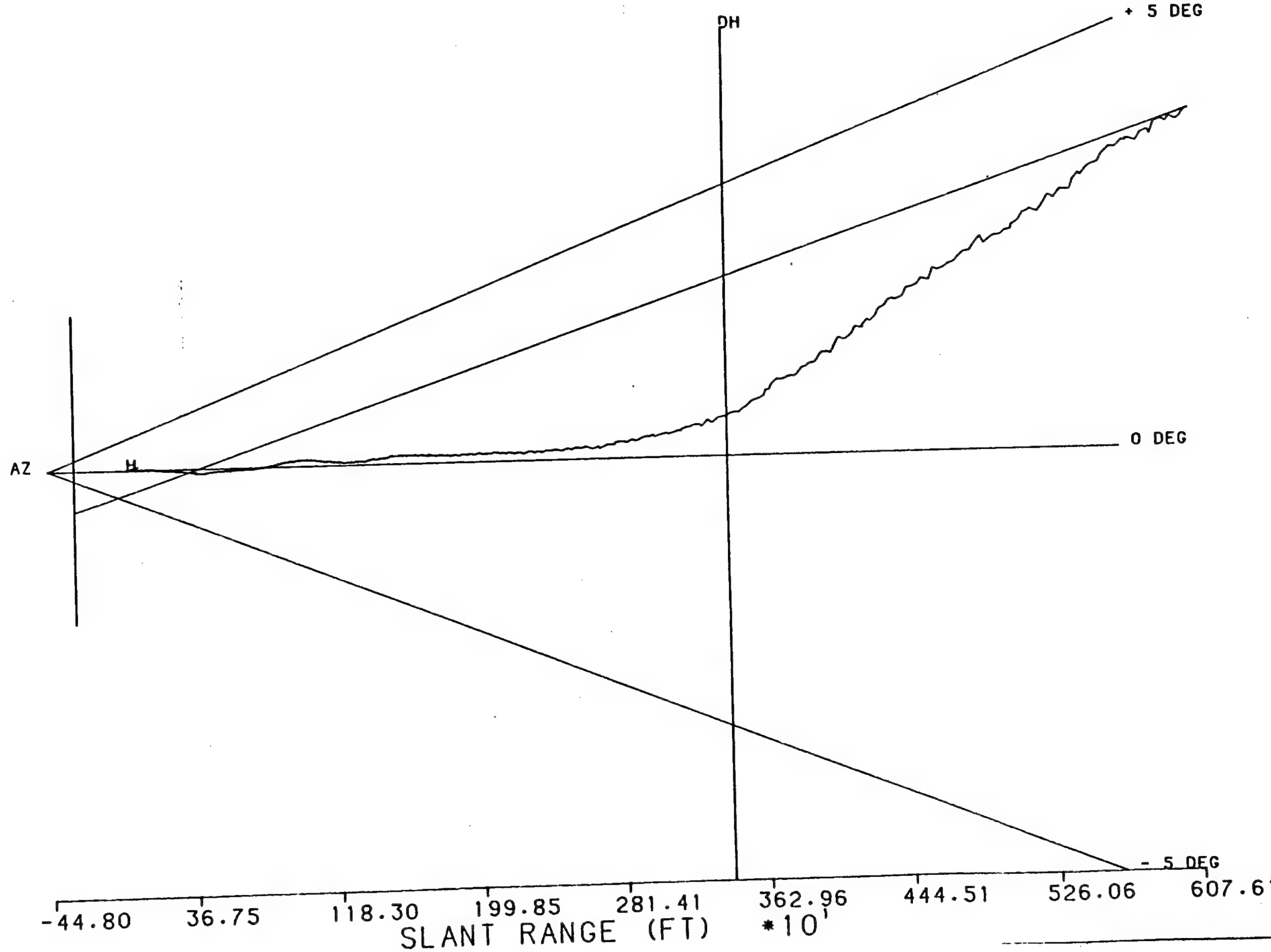

RUN # 5
6/6/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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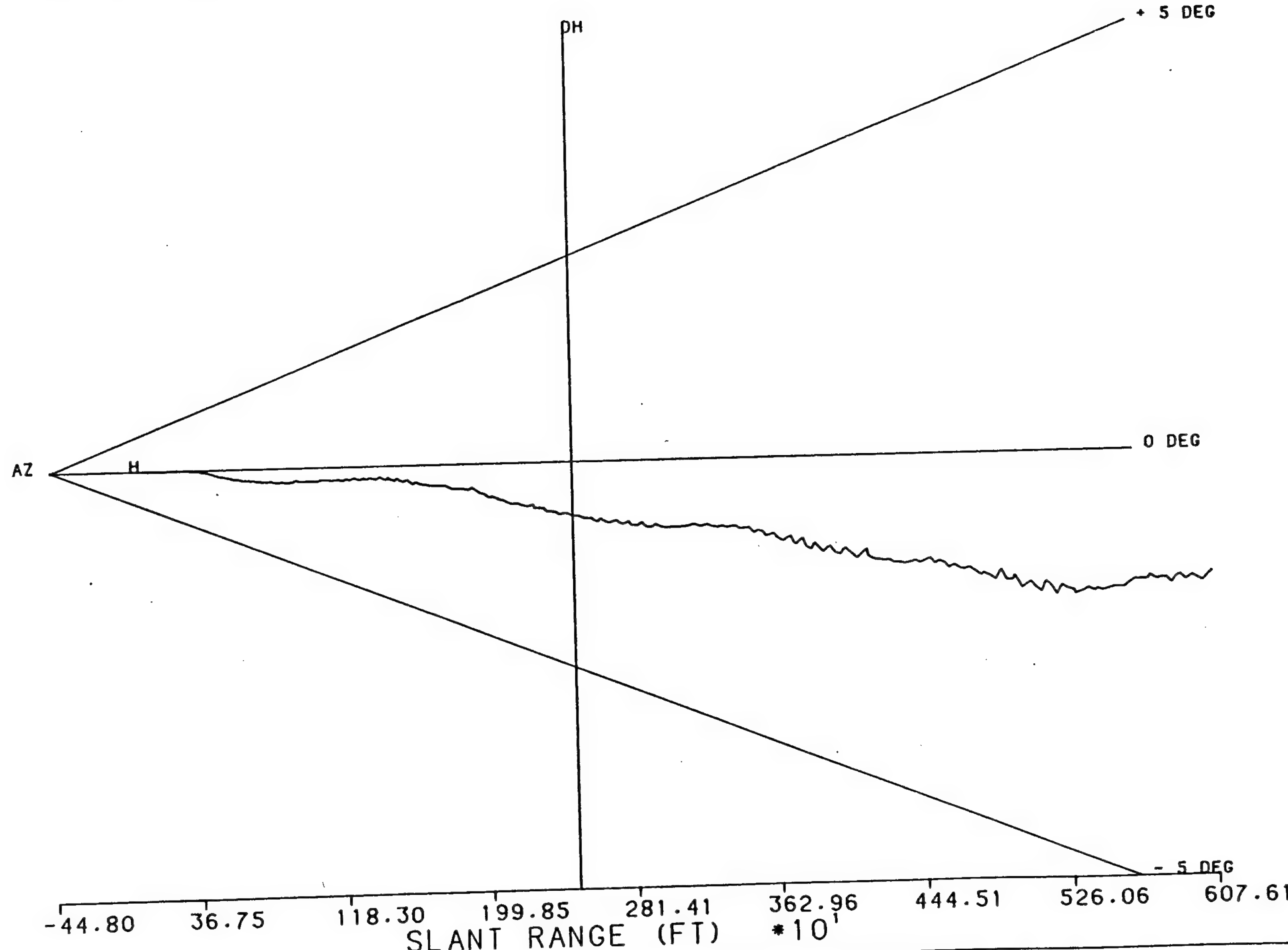

RUN # 6
6/6/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE R AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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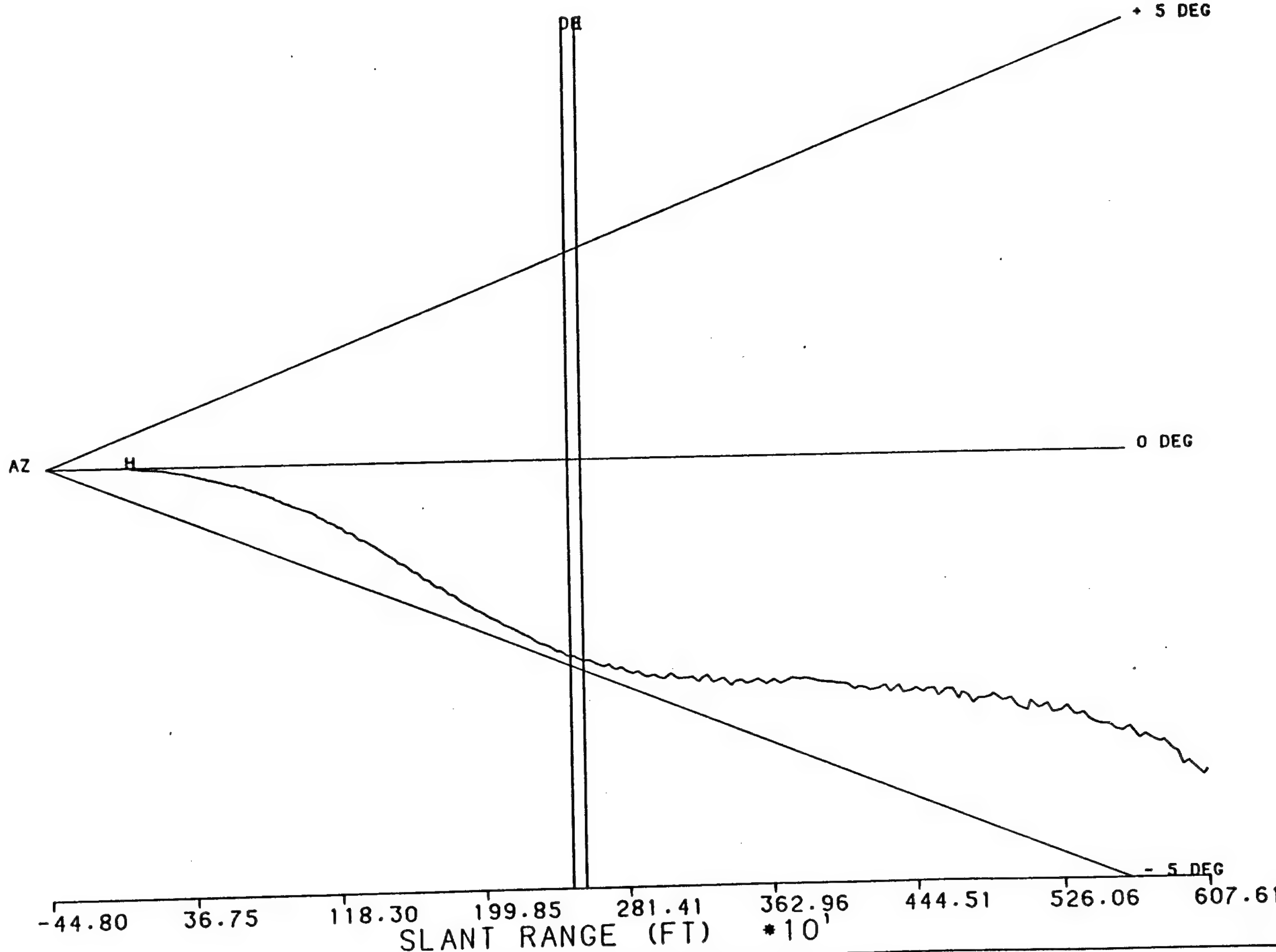
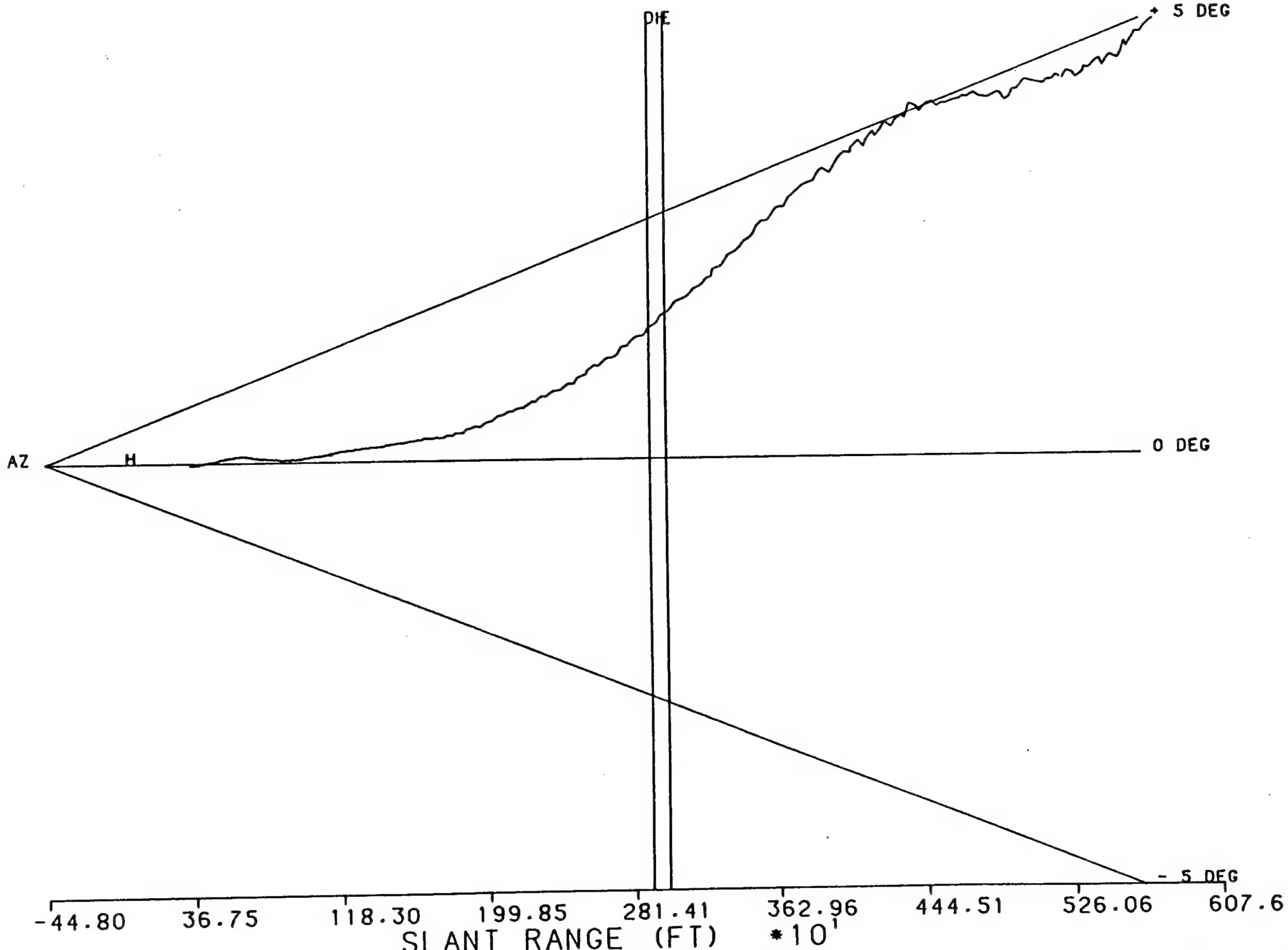


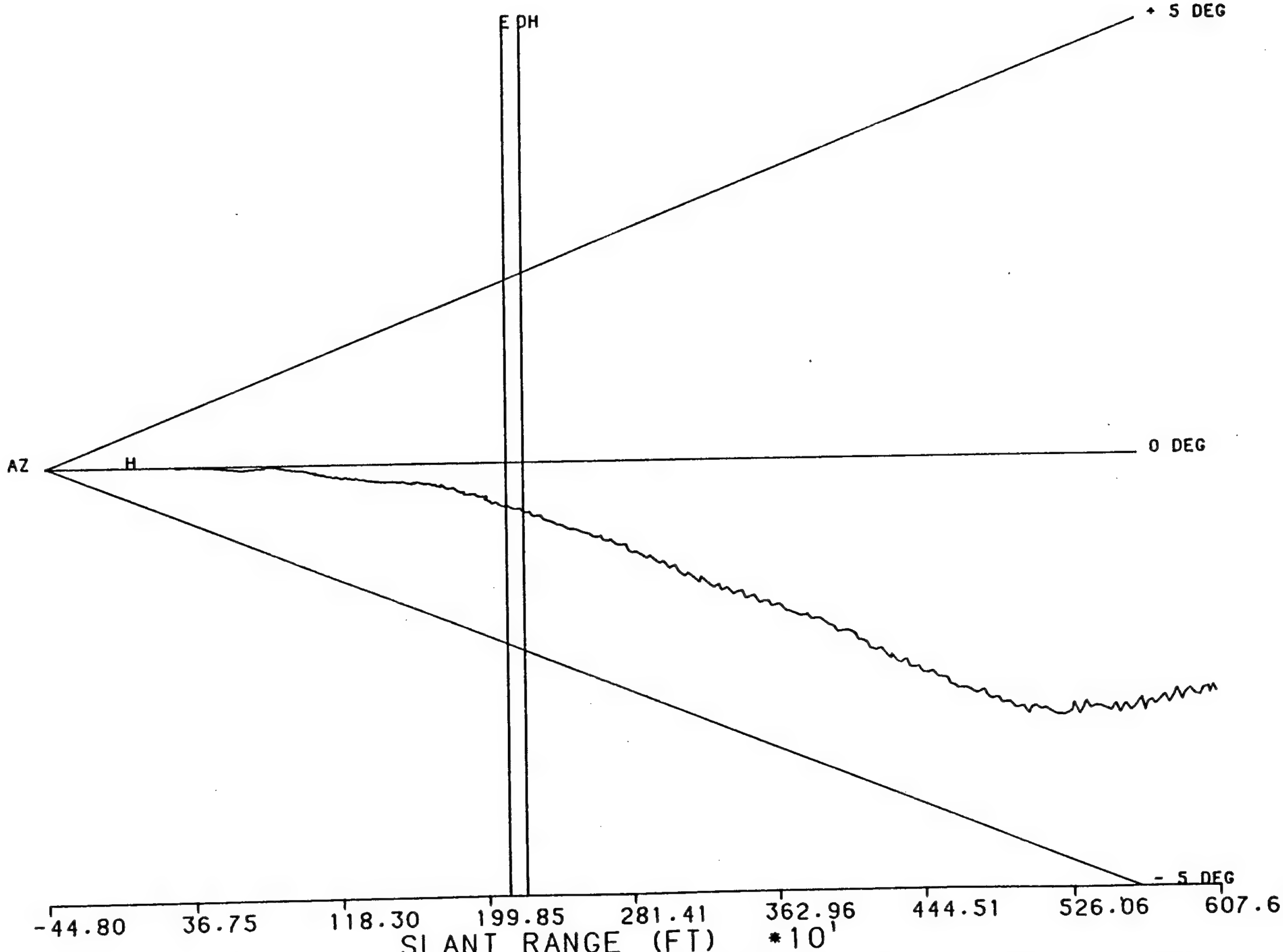
RUN # 7
6/6/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE L AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 8
6/6/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN #   9
6/6/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 5 DEGREE R AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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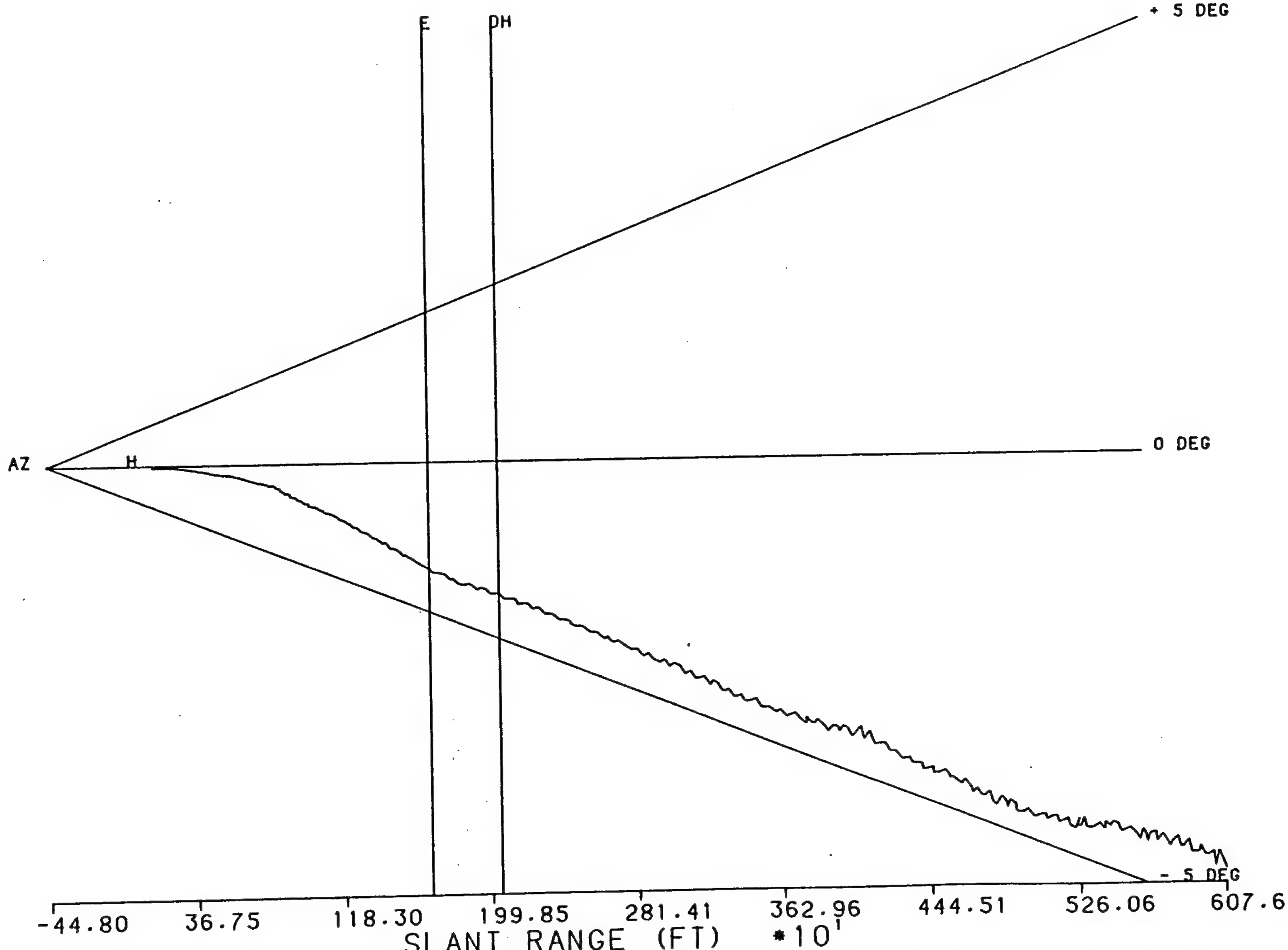
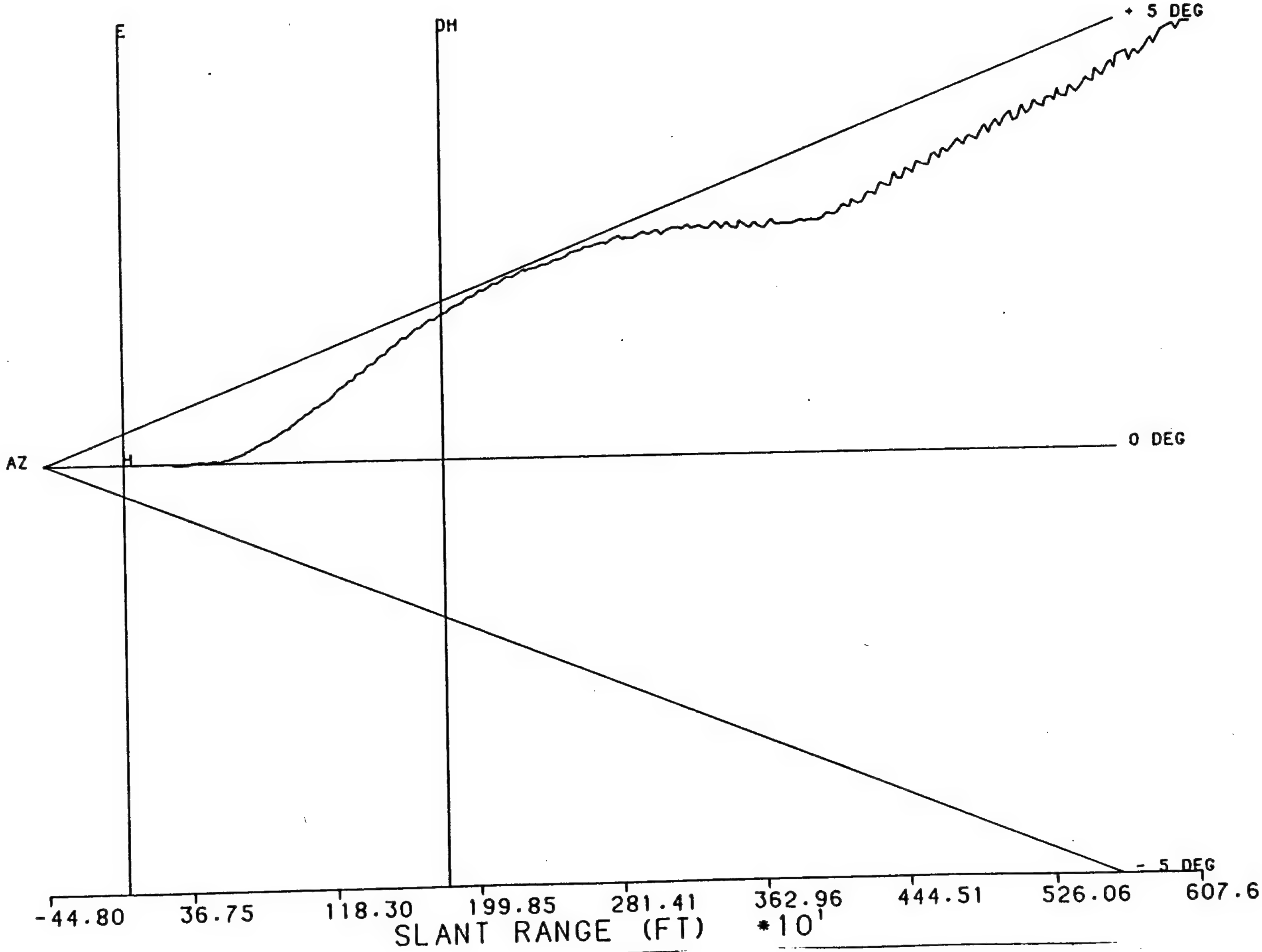


RUN # 10
6/6/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 5 DEGREE L AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 1
6/2/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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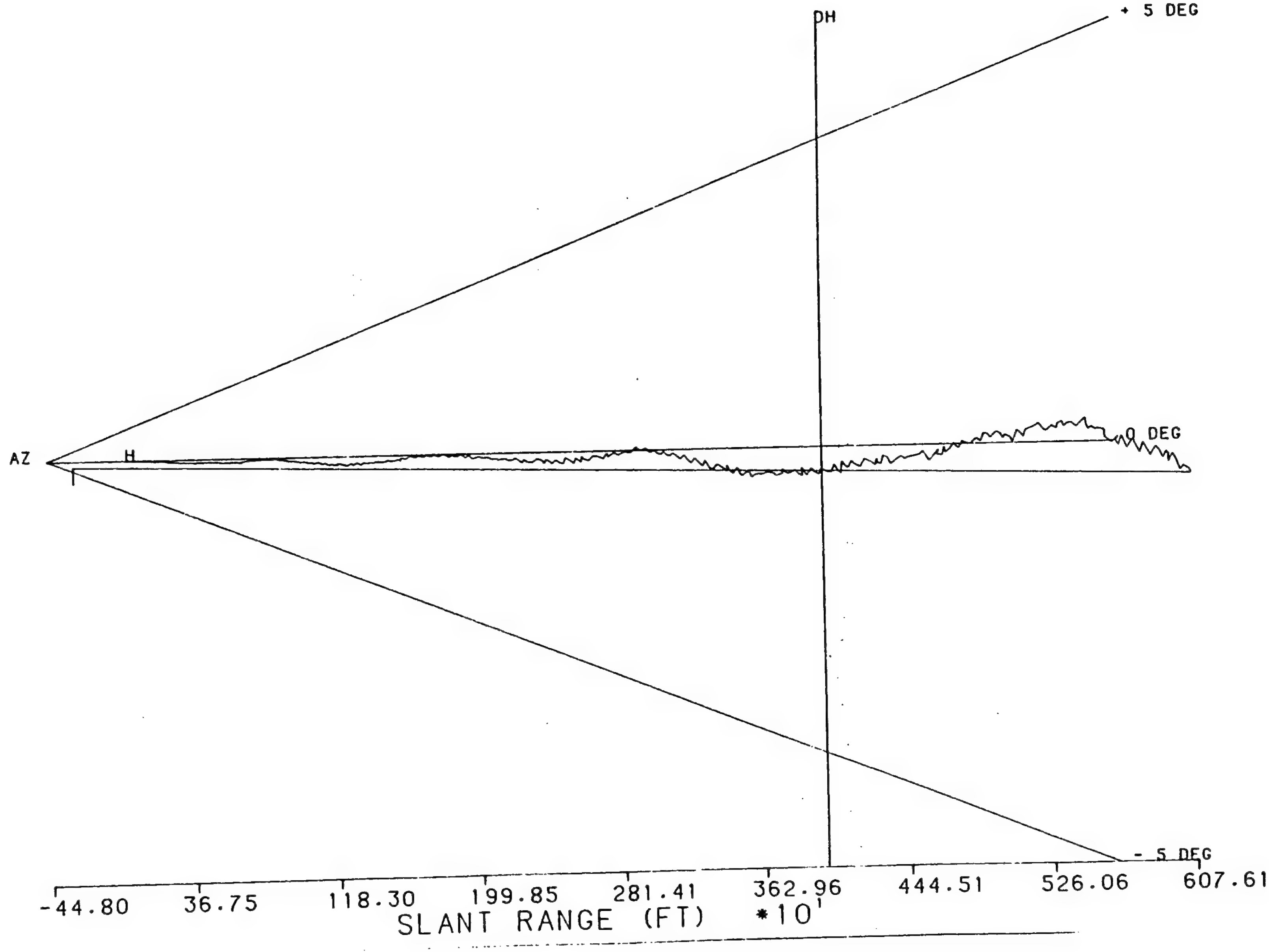

RUN # 2
6/2/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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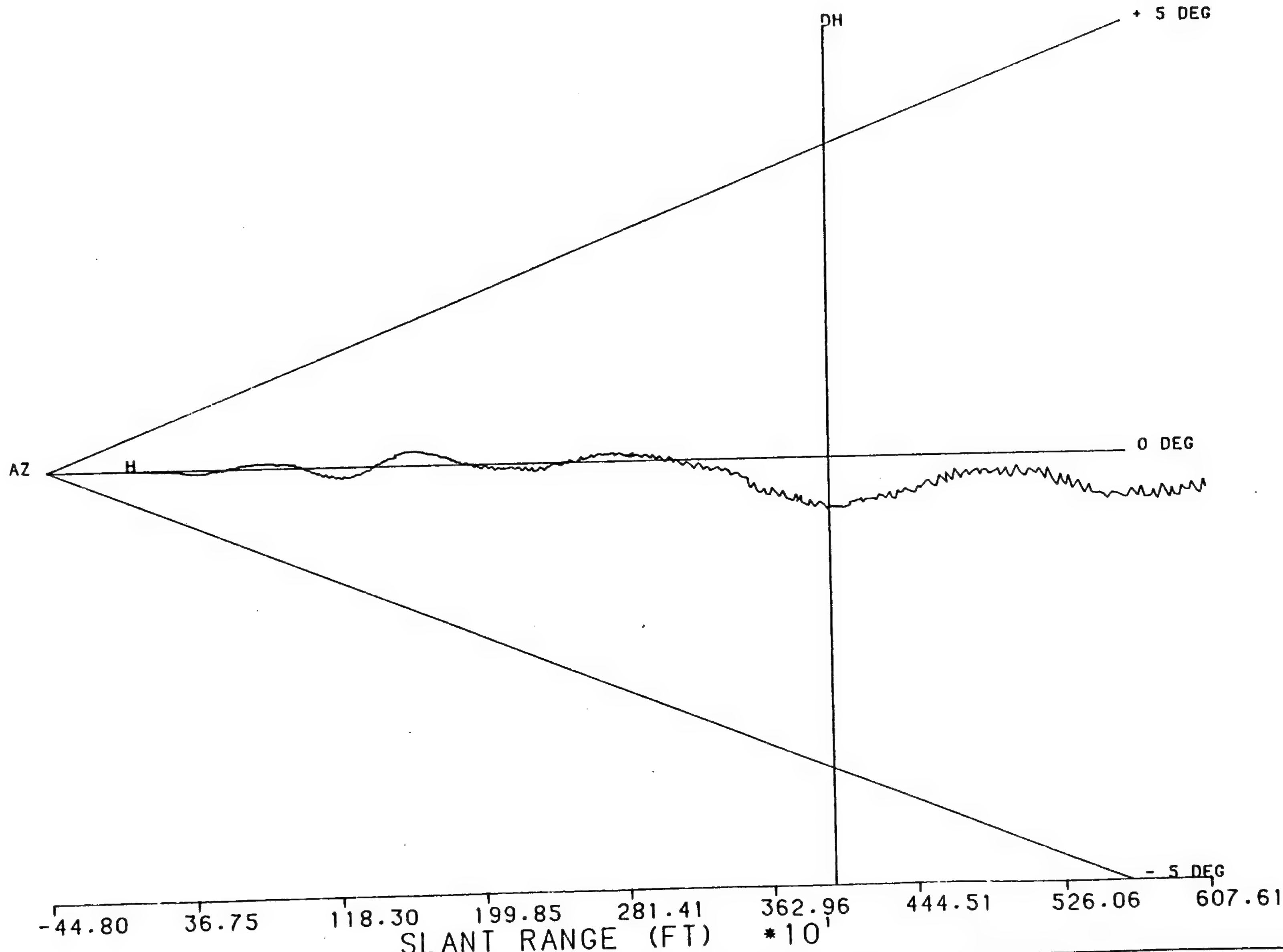

RUN # 3
6/2/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 5 DEGREE R AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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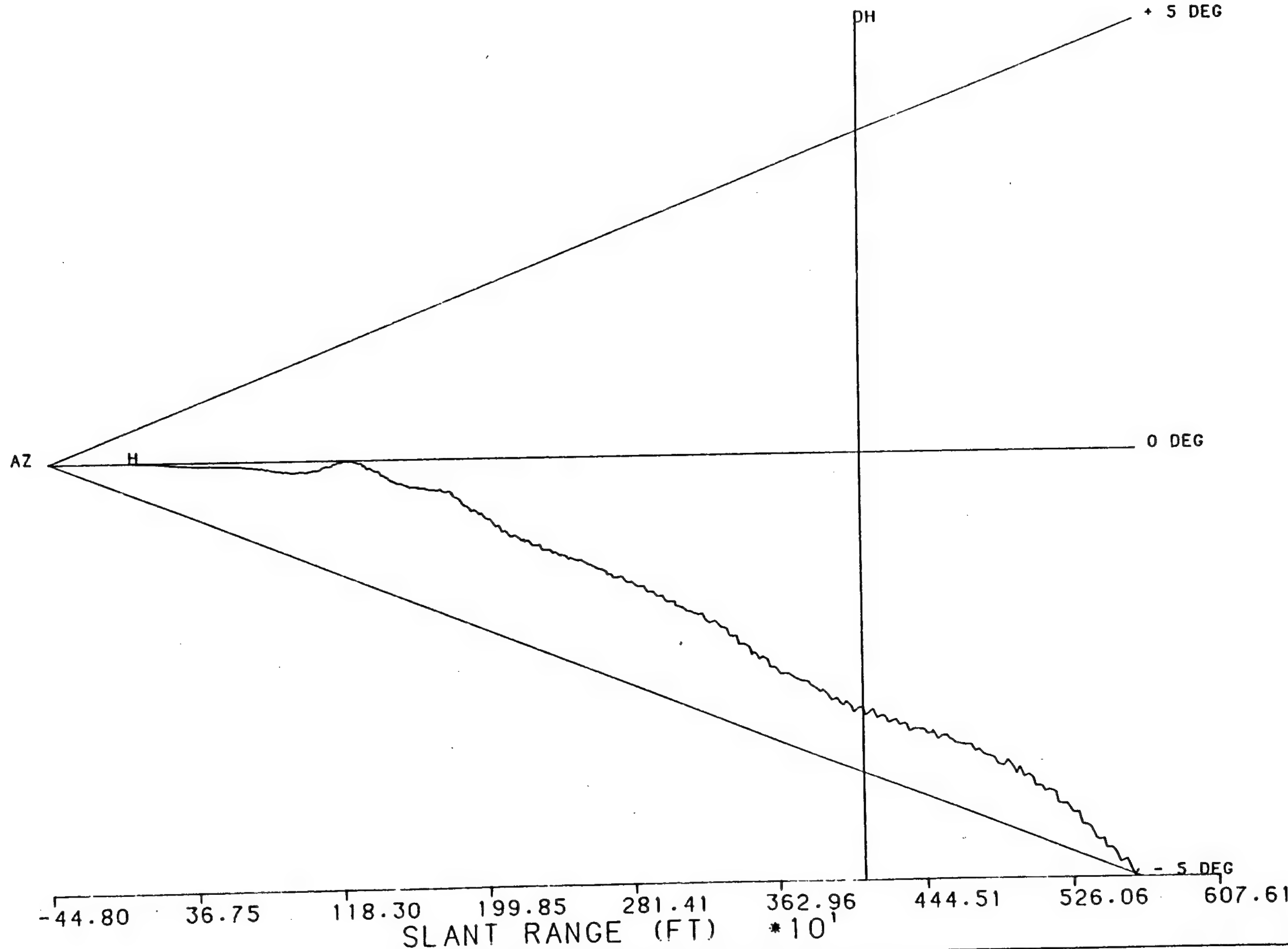

RUN # 4
6/2/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 5 DEGREE L AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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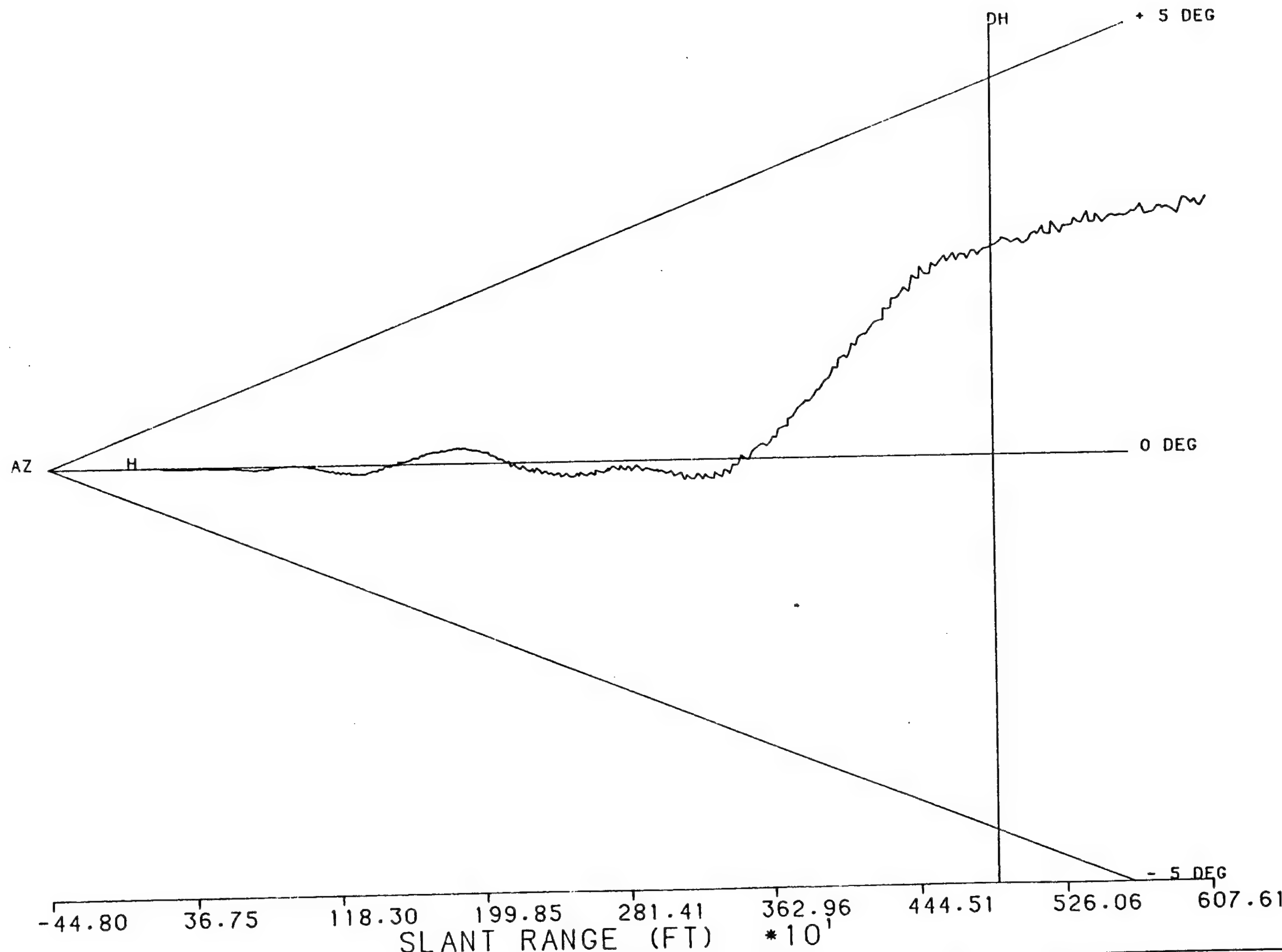

RUN # 5
6/2/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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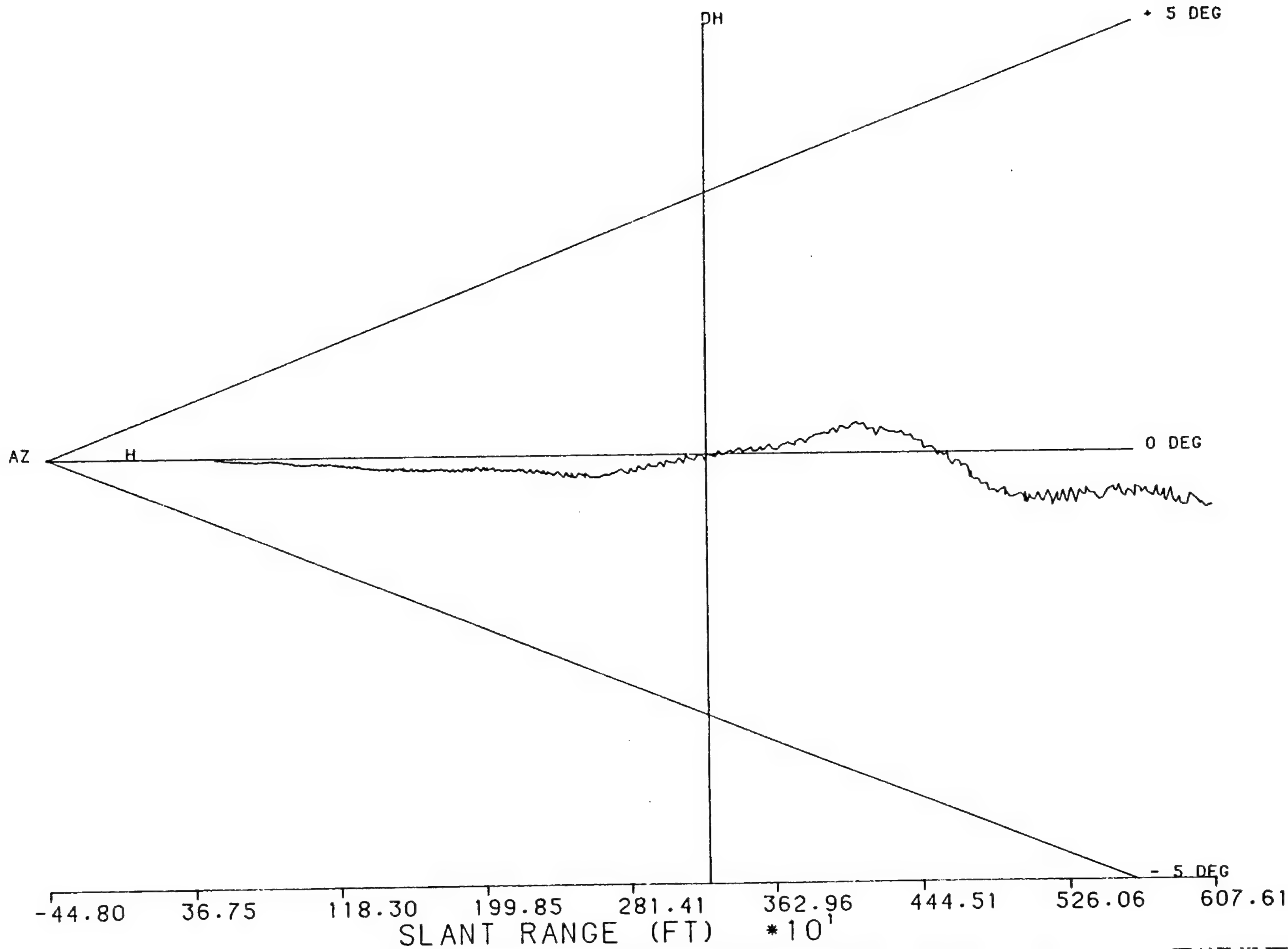

RUN # 6
6/2/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE R AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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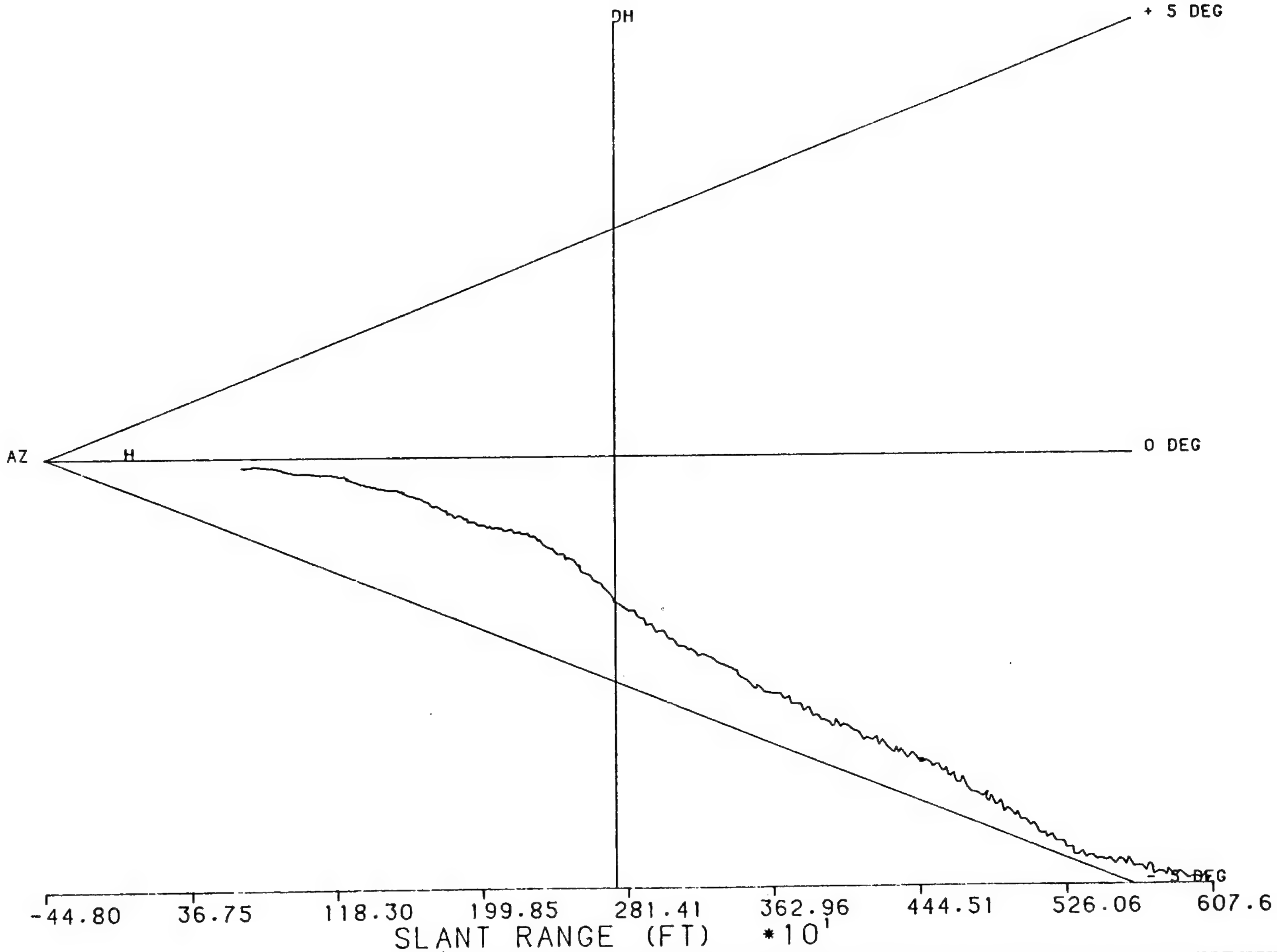

RUN # 7
6/2/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE L AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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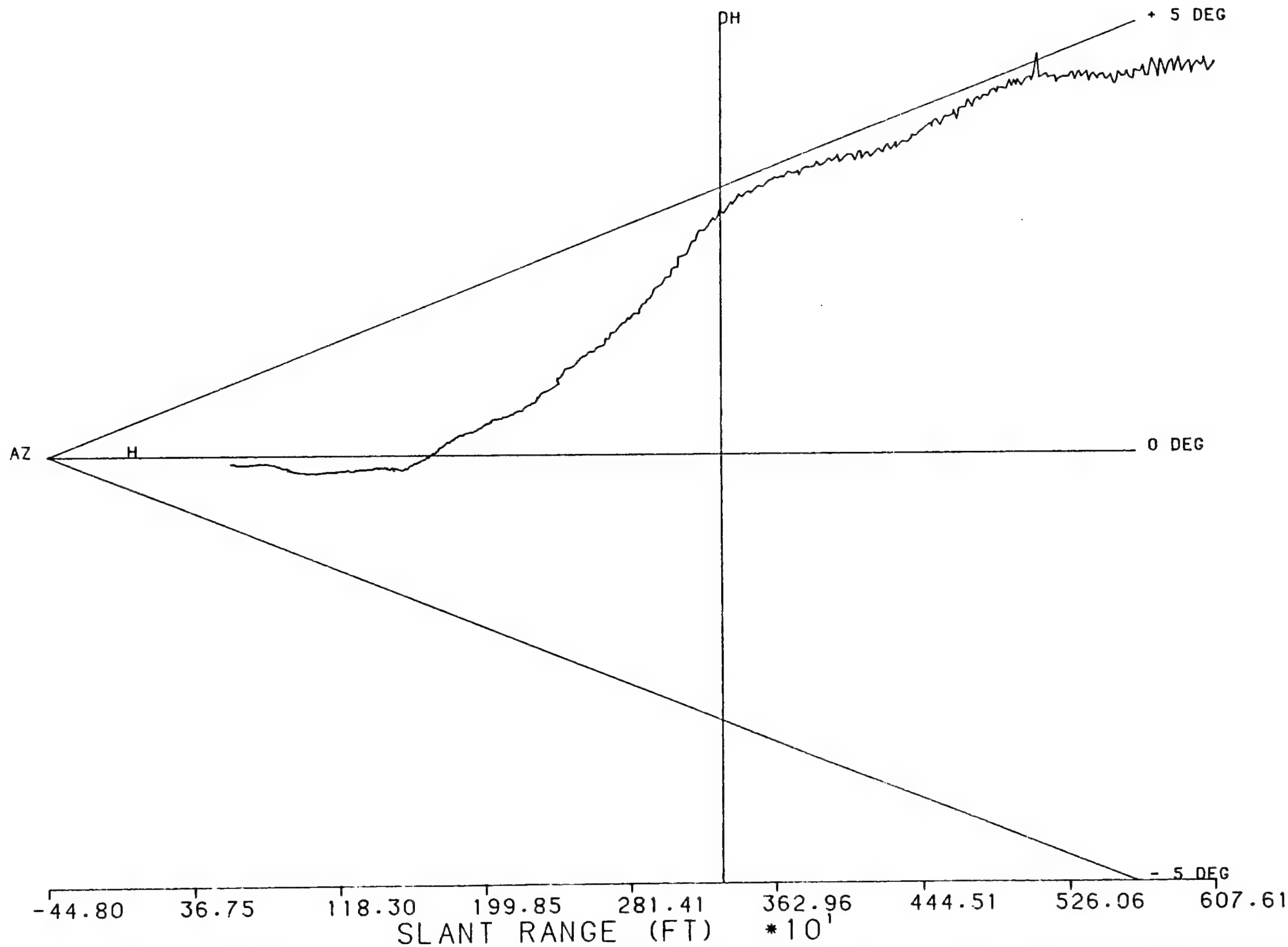

RUN # 8
6/2/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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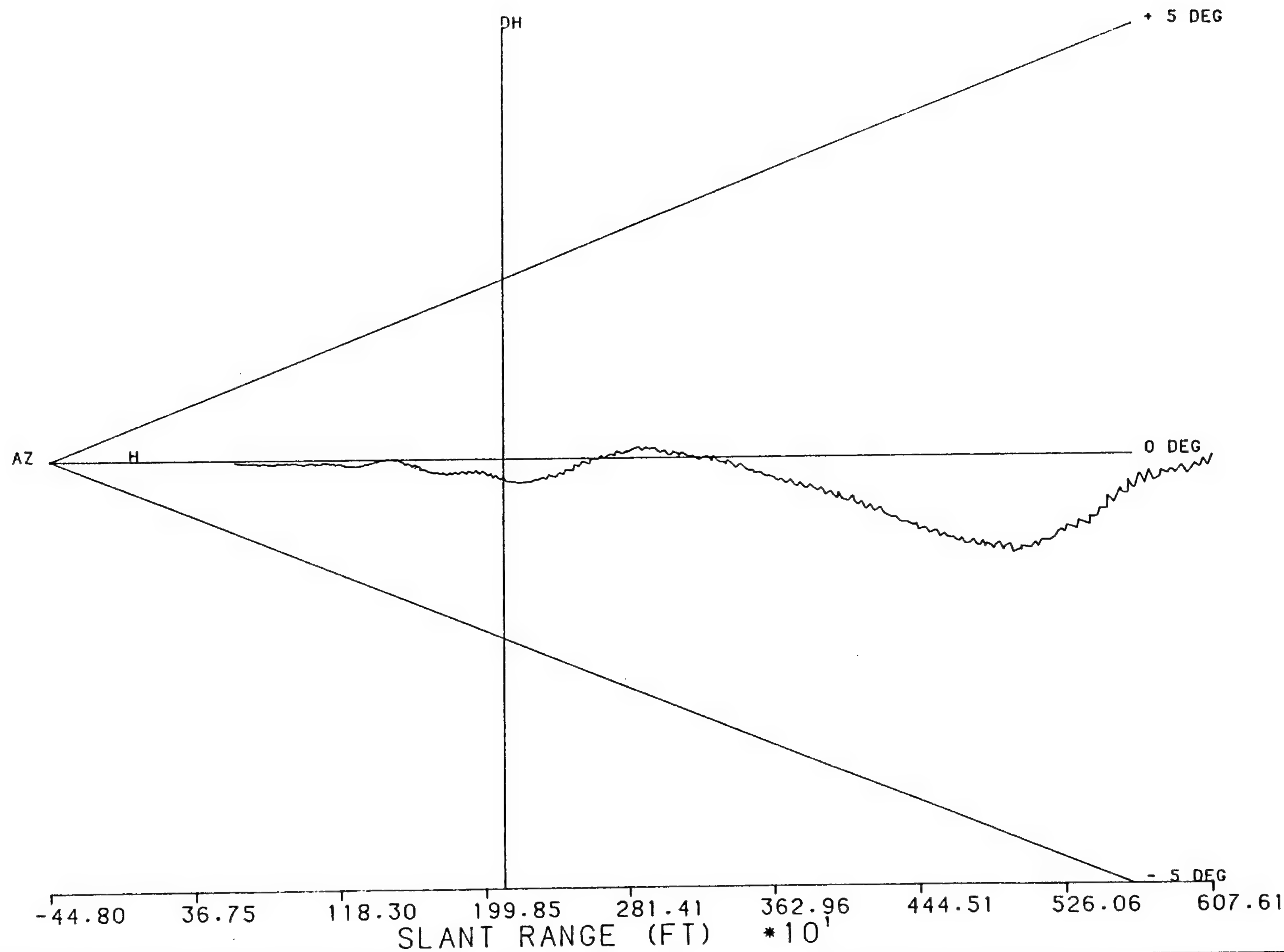

RUN # 9
6/2/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 5 DEGREE R AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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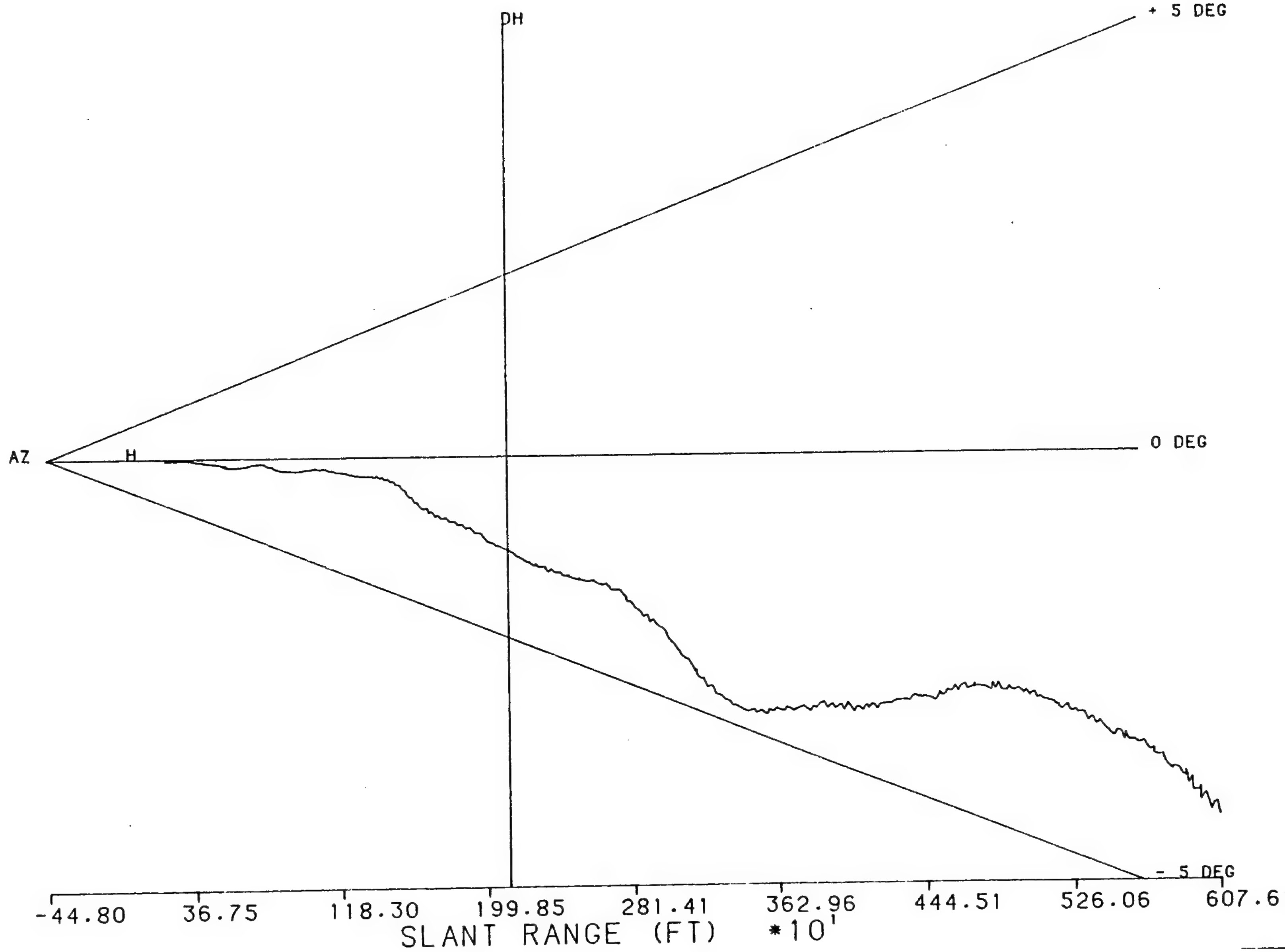

RUN # 10
6/2/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 5 DEGREE L AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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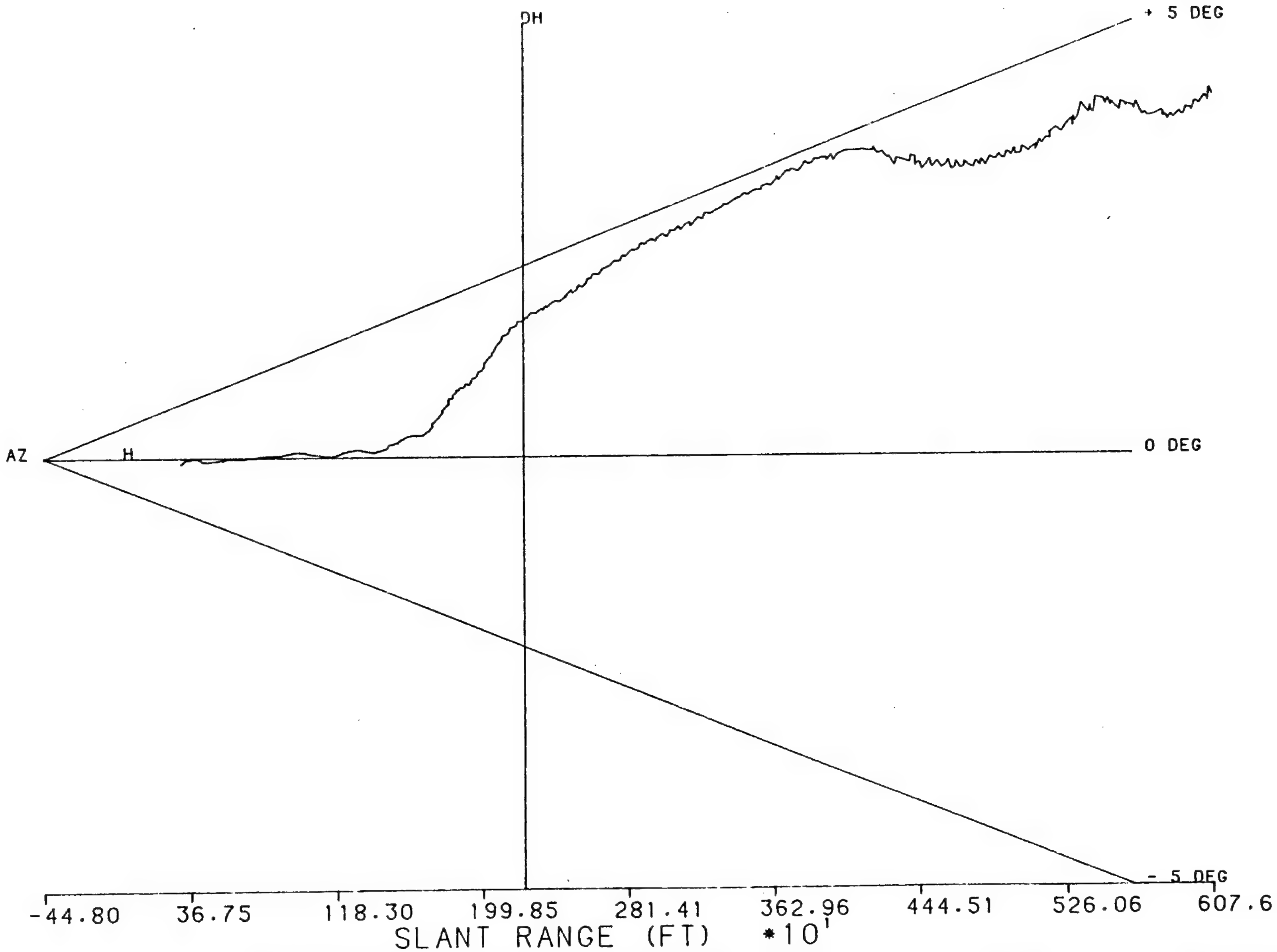

RUN # 1
5/26/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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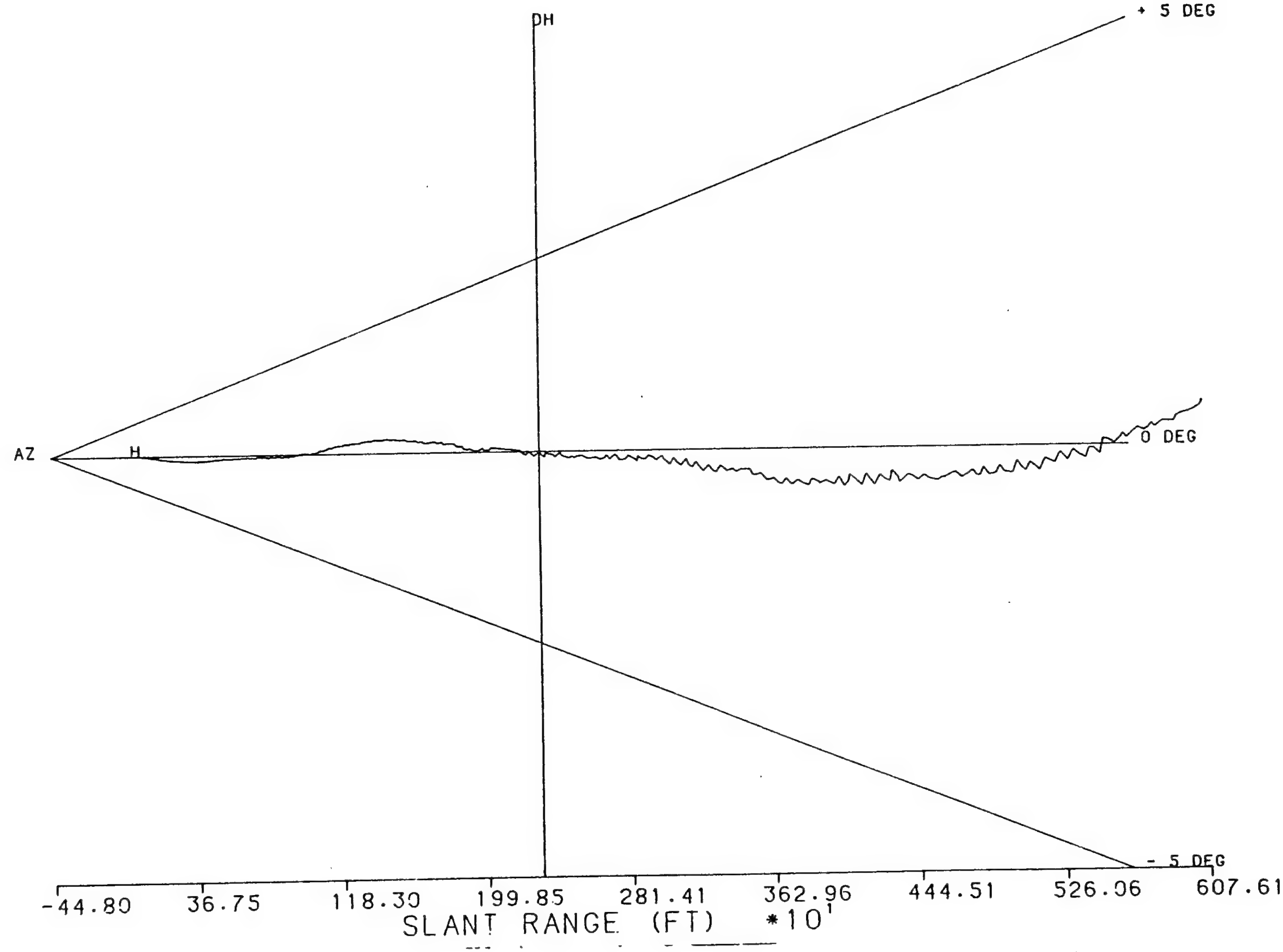

RUN # 2
5/26/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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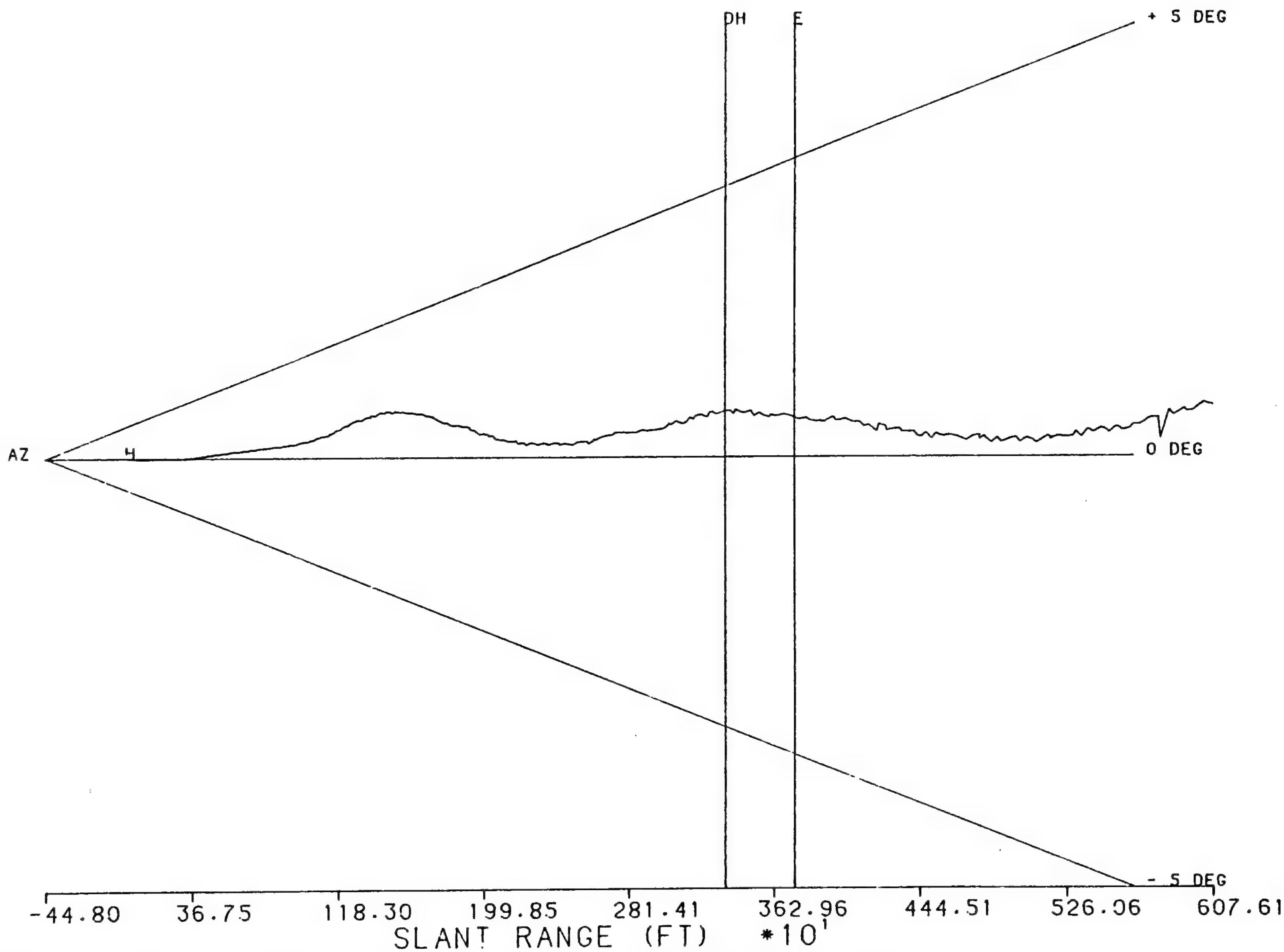

RUN # 3
5/26/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 5 DEGREE R AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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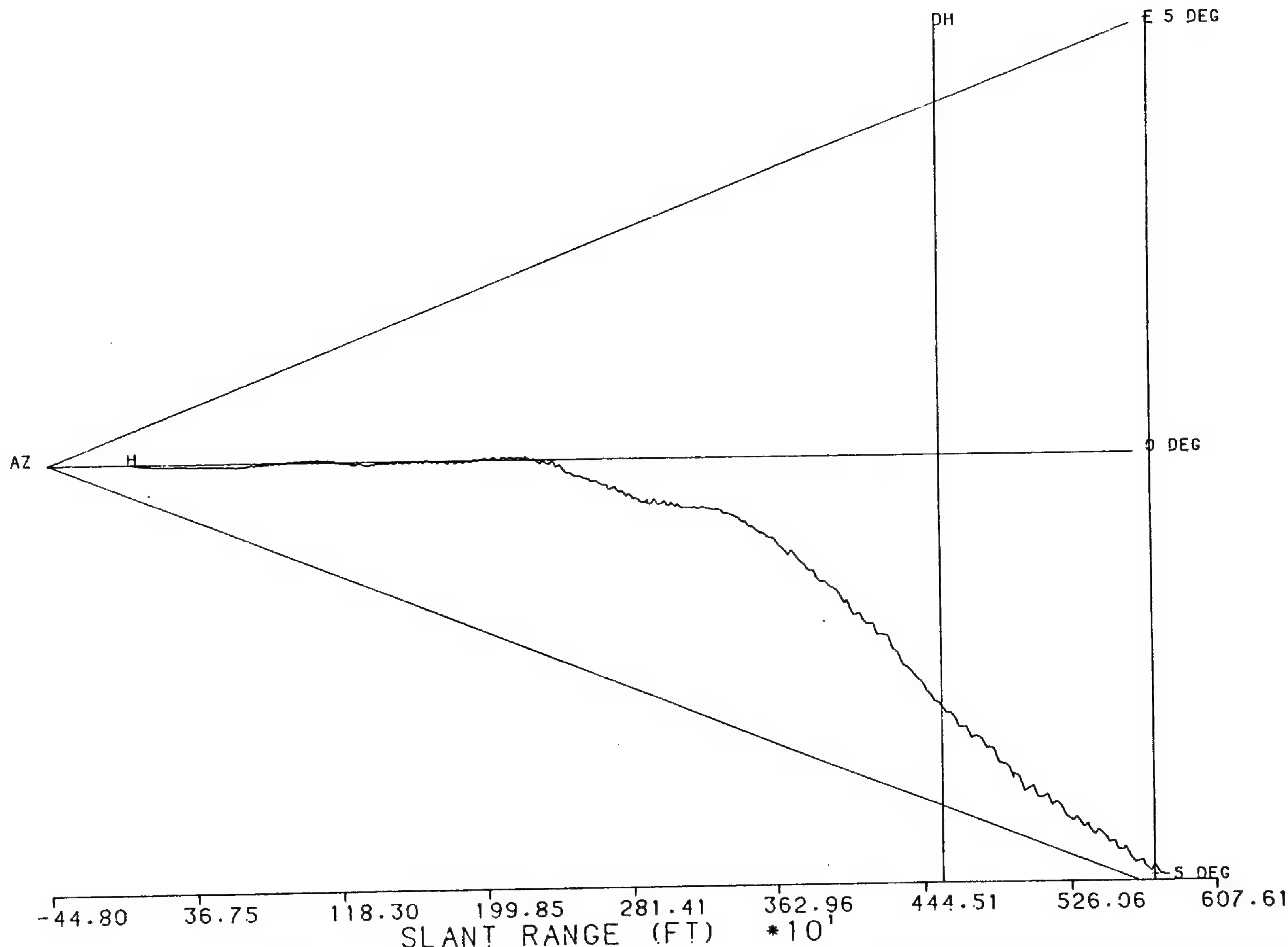

RUN # 4
5/26/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 5 DEGREE L AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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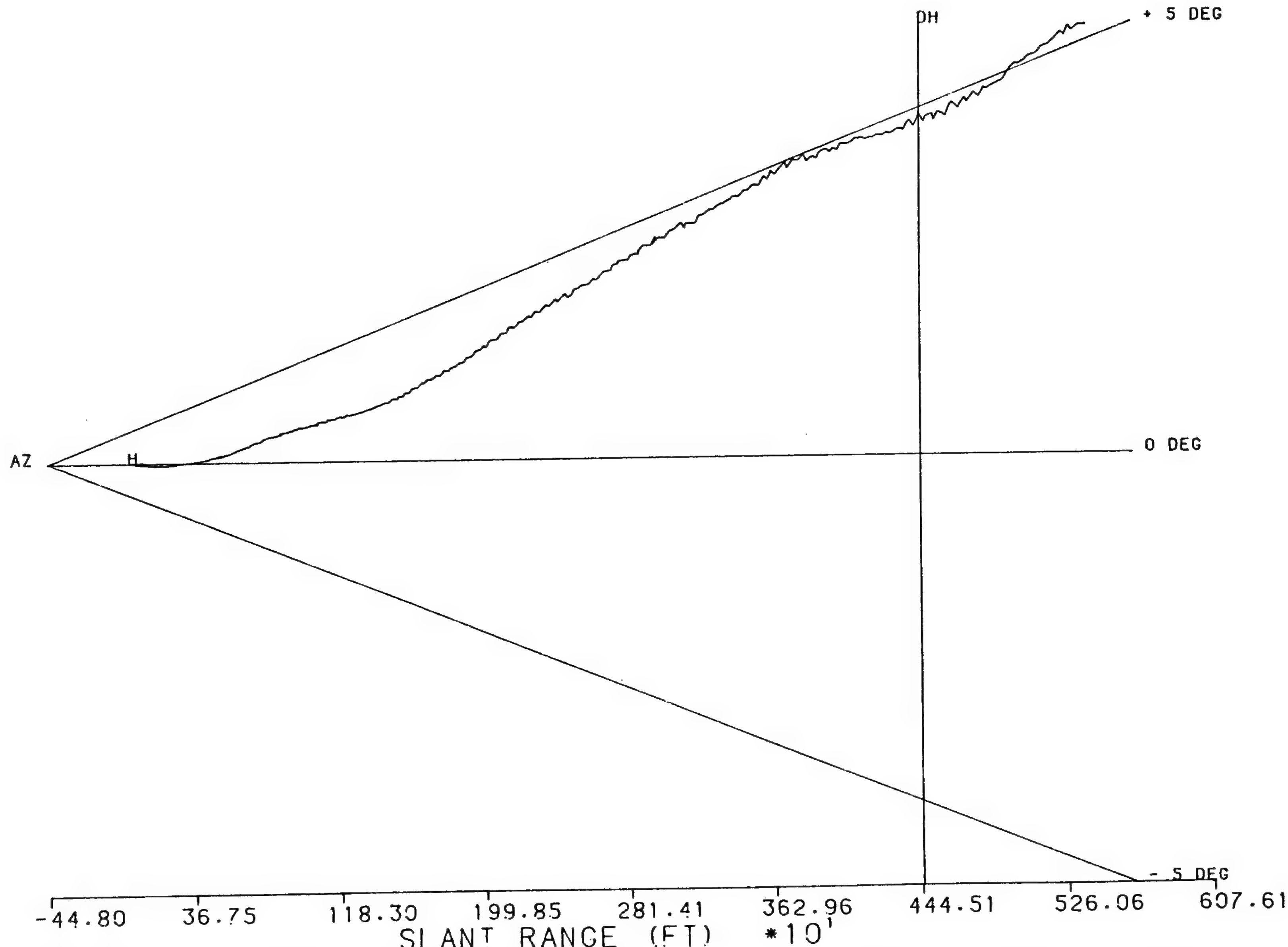

RUN # 5
5/26/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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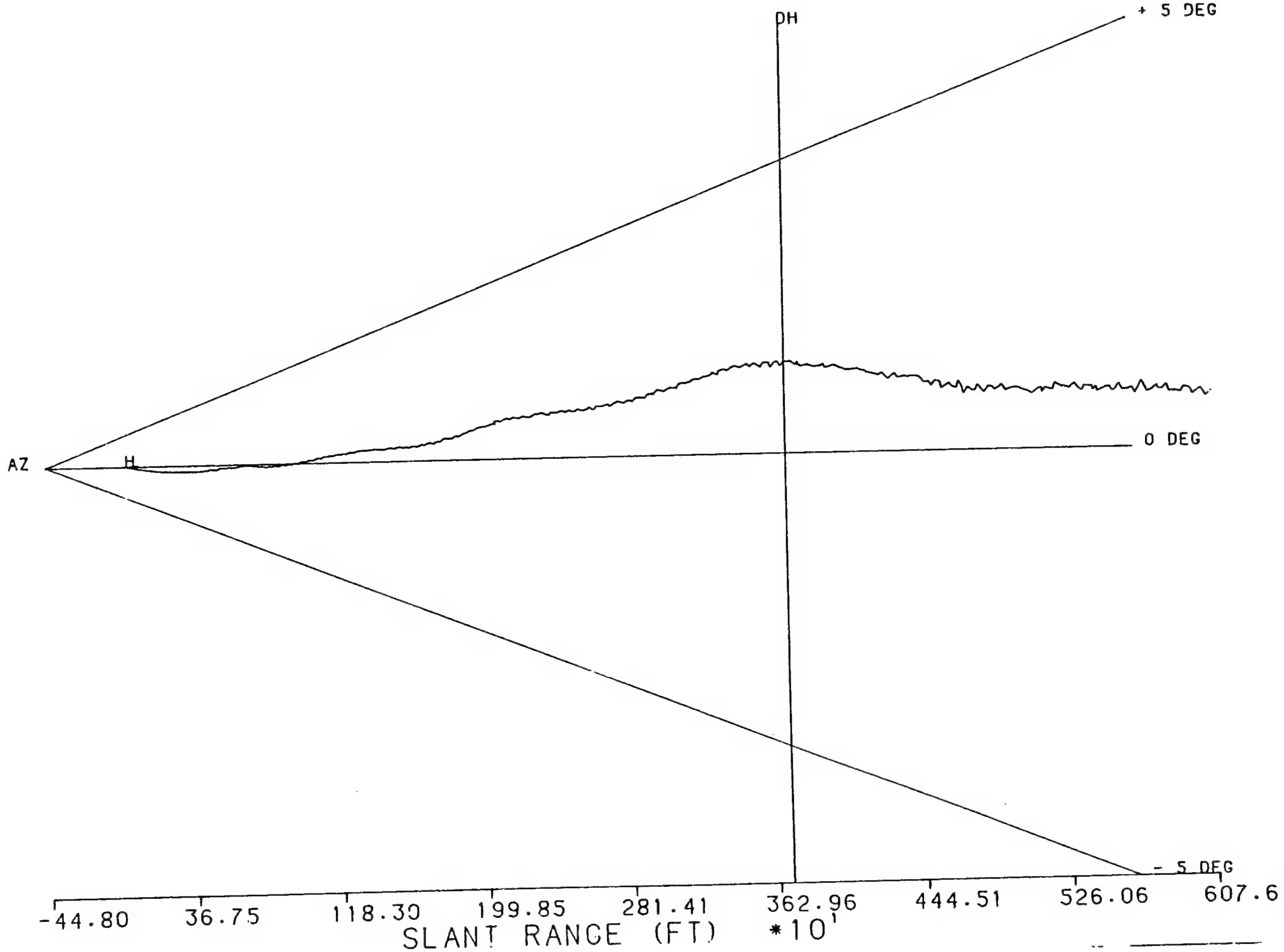

RUN # 6
5/26/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE R AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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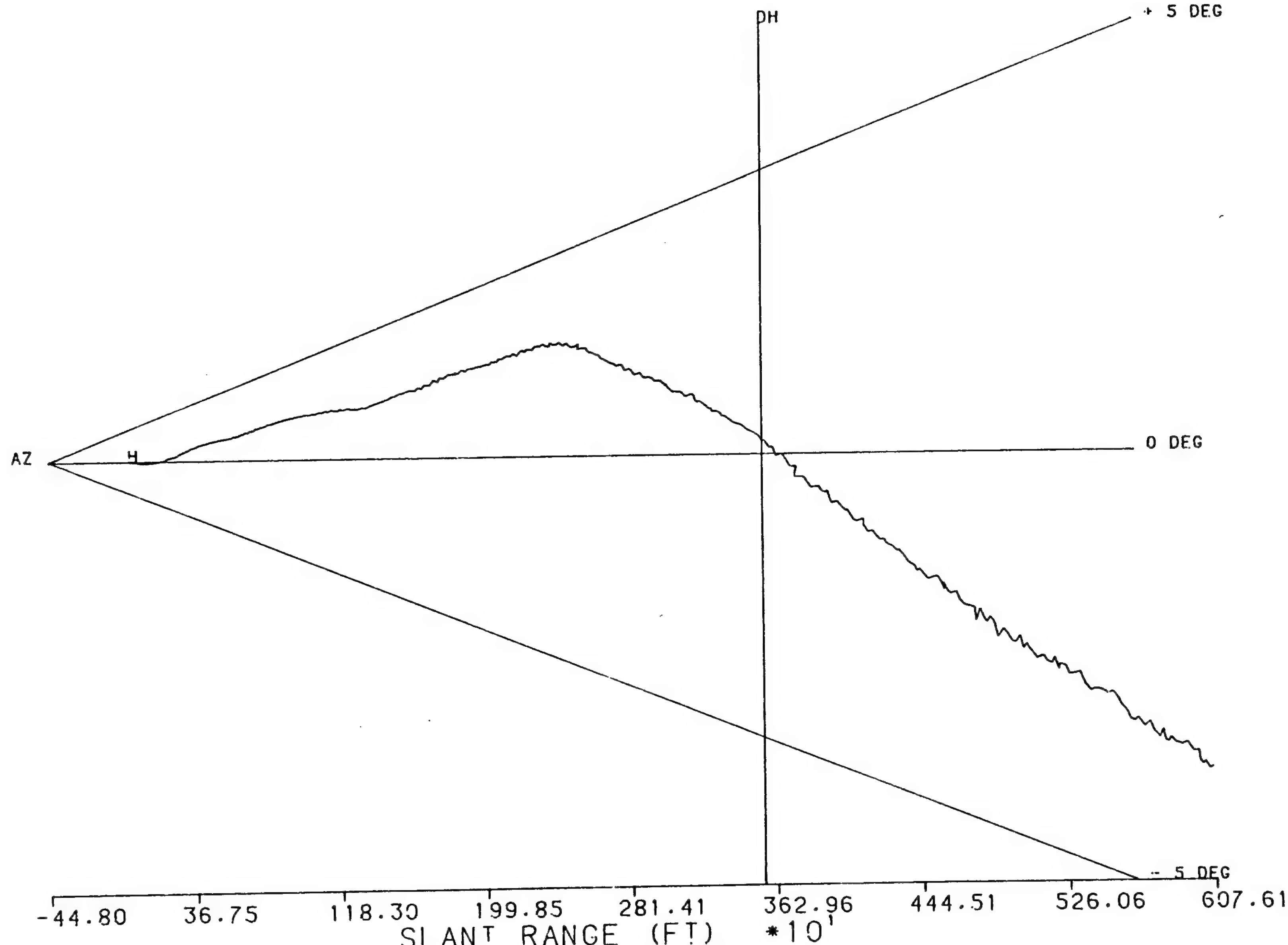

RUN # 7
5/26/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE L AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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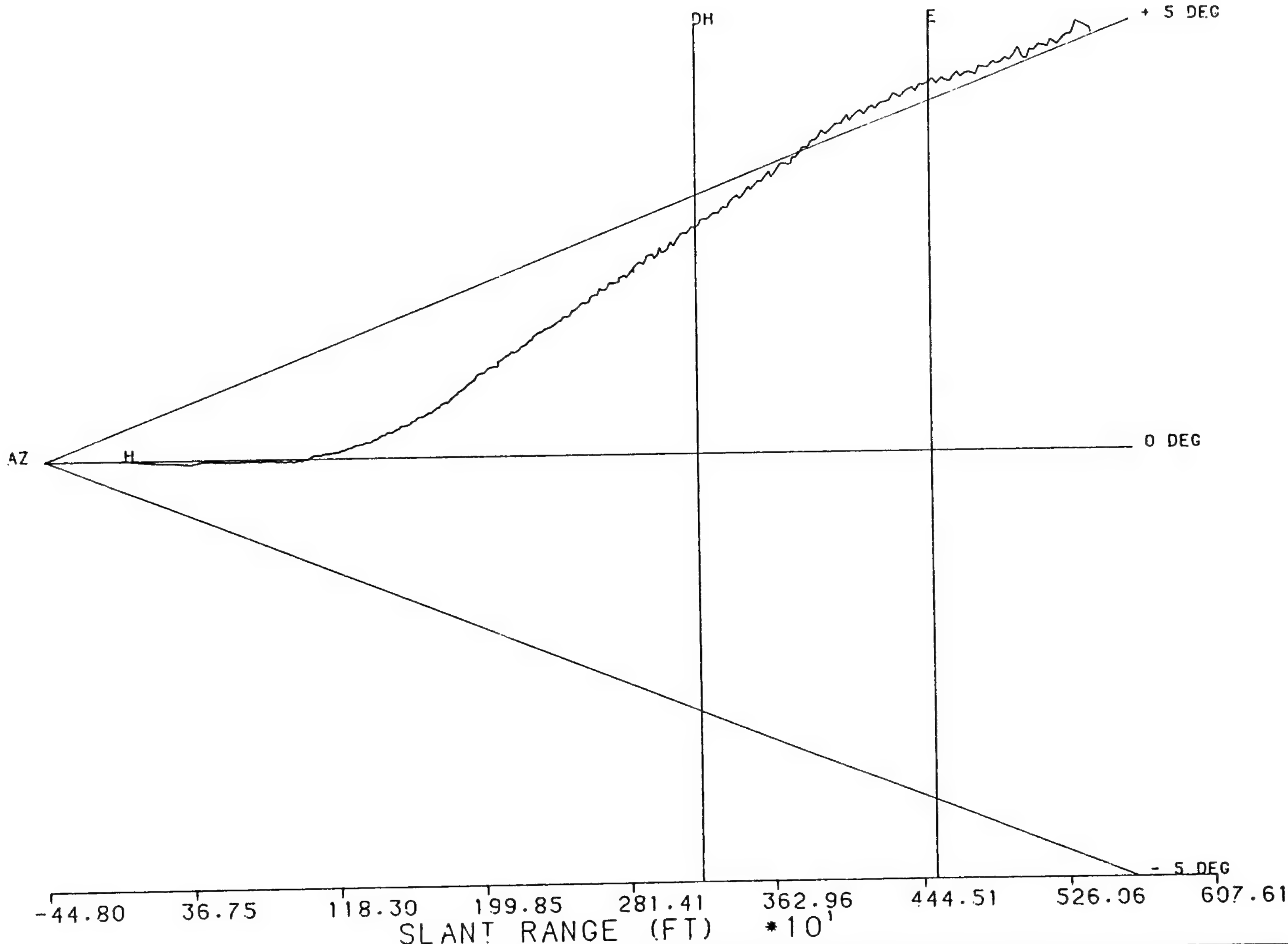

RUN # 8
5/26/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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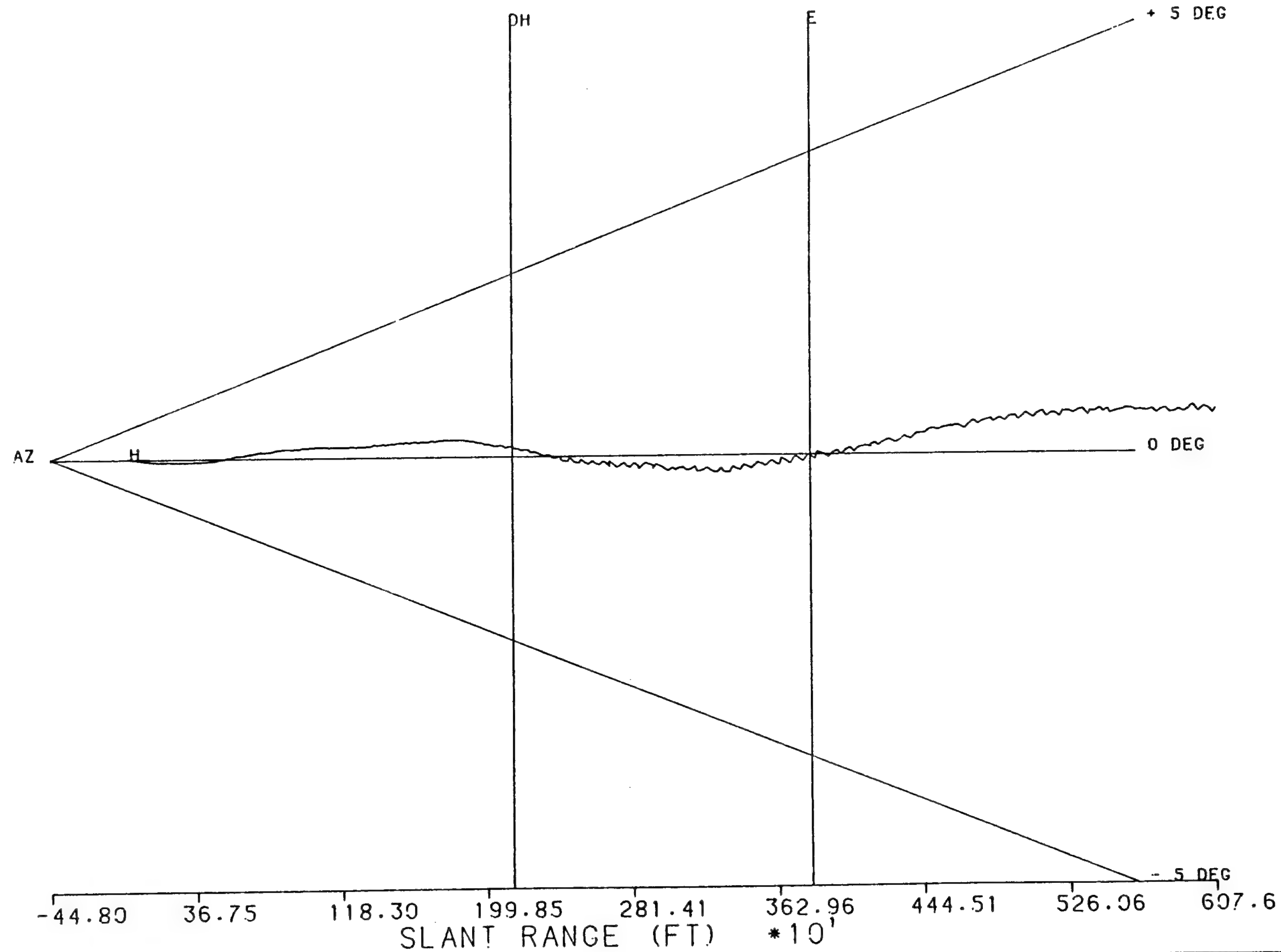

RUN # 9
5/26/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 5 DEGREE R AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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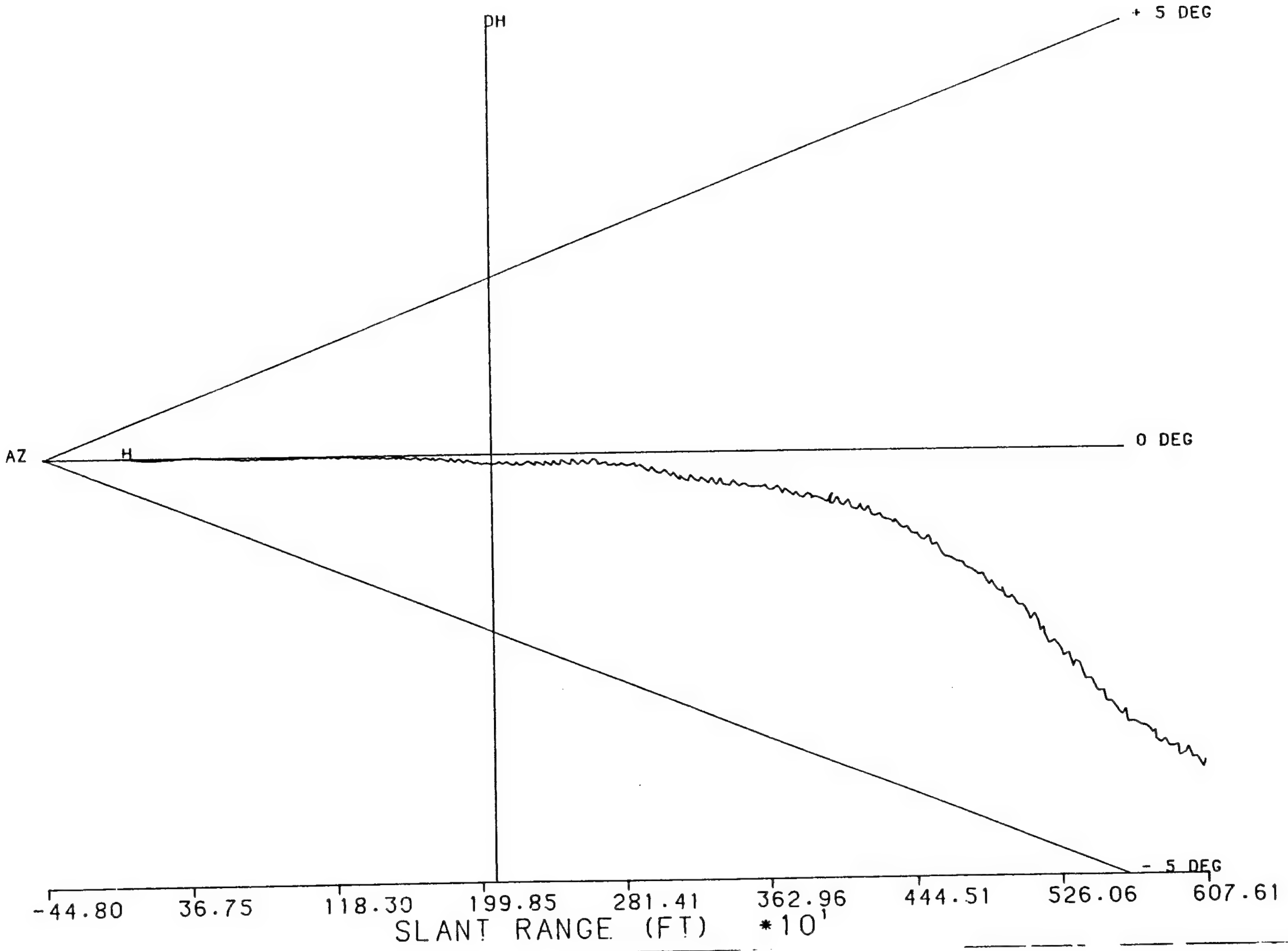

RUN # 10

5/26/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 5 DEGREE L AZ OFF

AZIMUTH : +- 0.00

ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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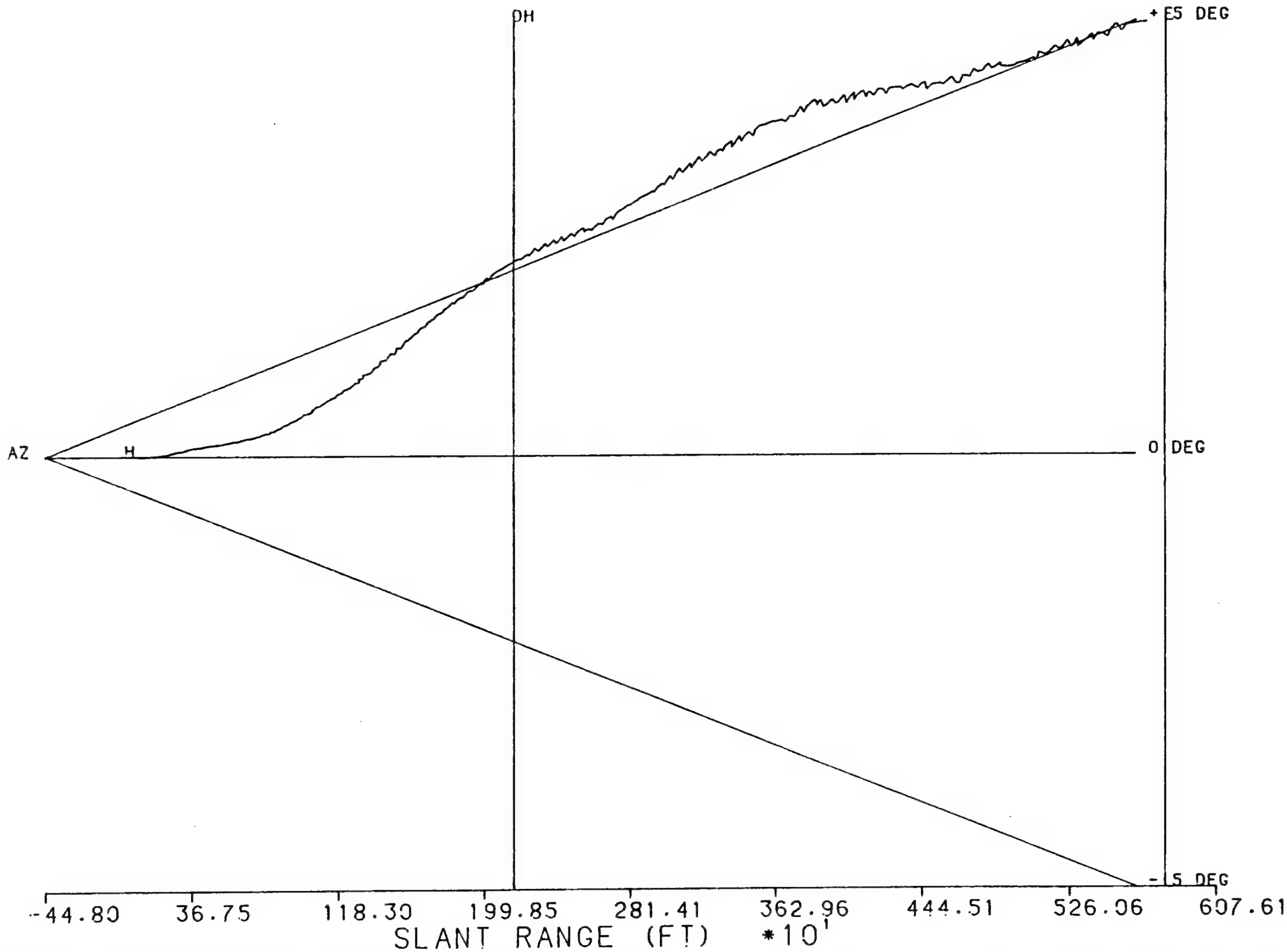

RUN # 1
5/25/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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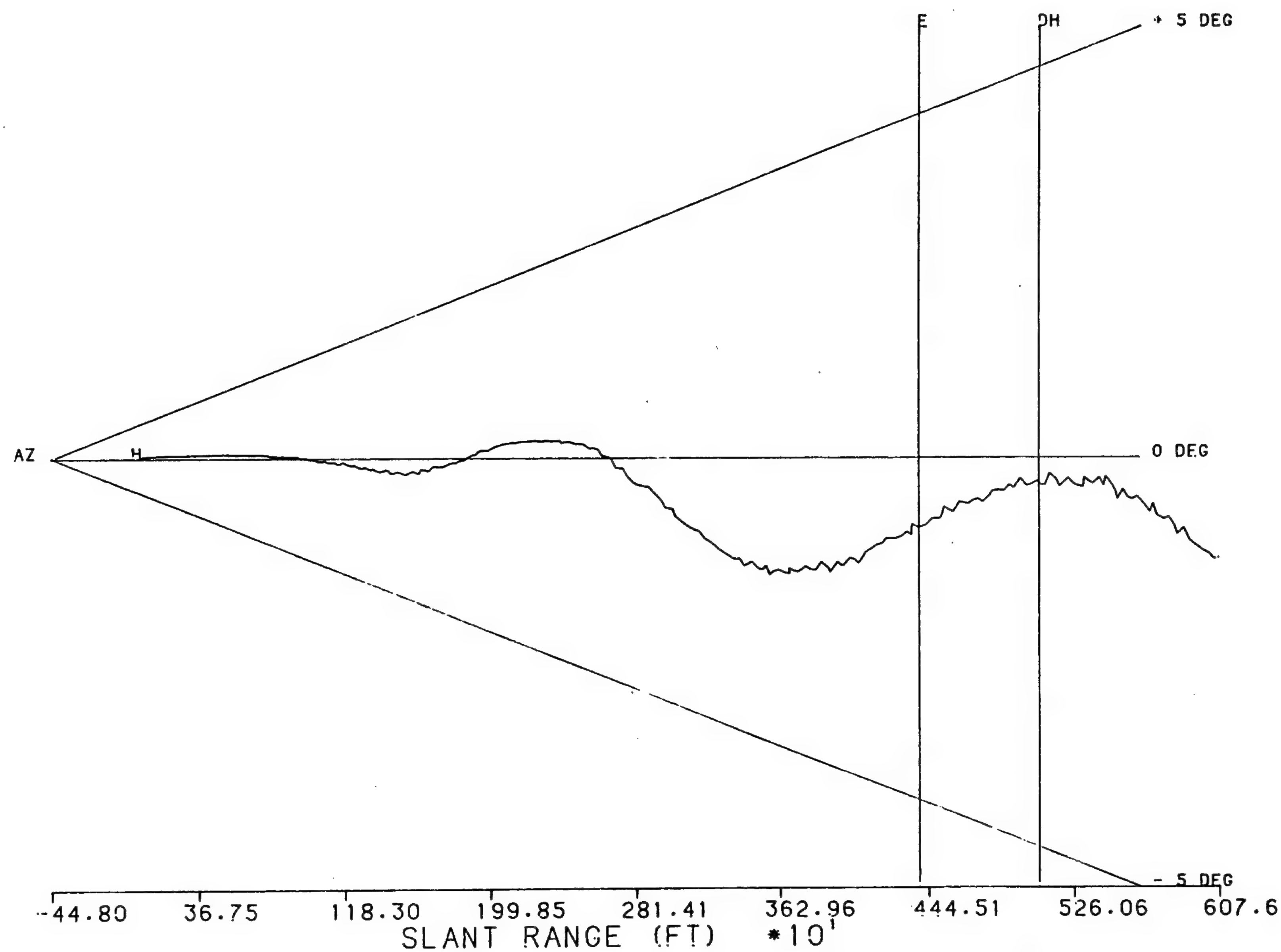

RUN # 2
5/25/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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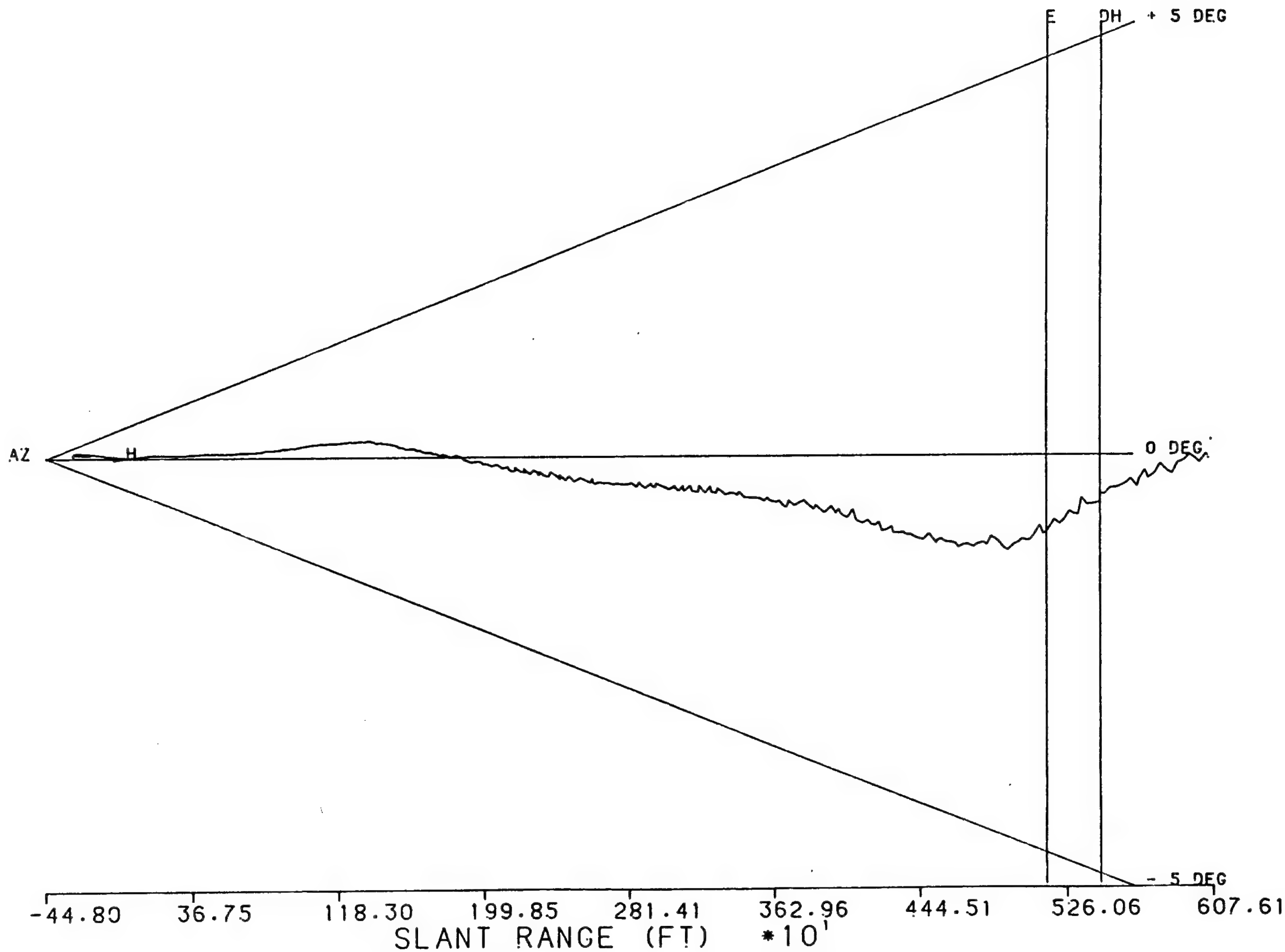
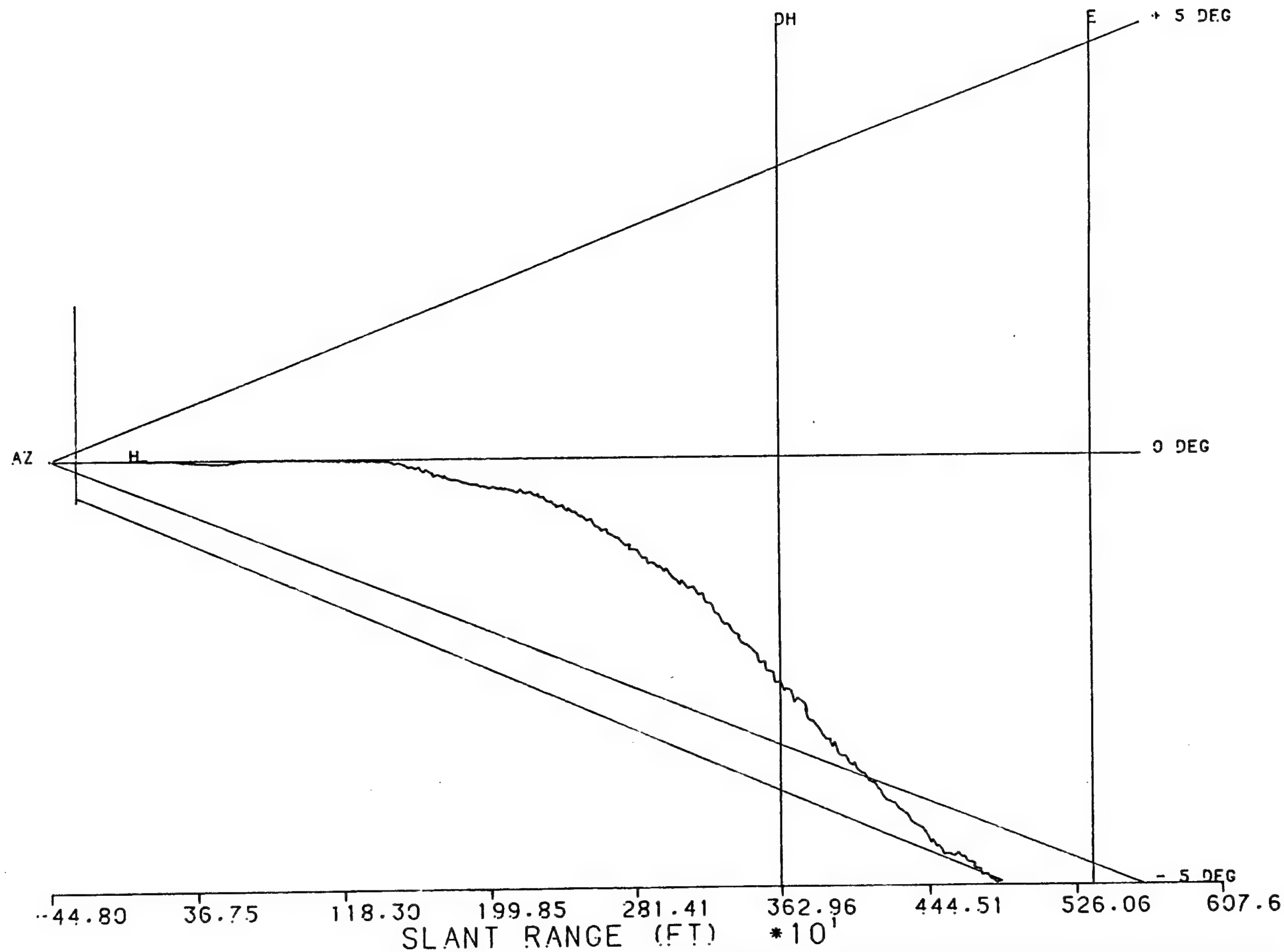


RUN # 3
5/25/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 5 DEGREE R AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 4

5/25/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 5 DEGREE L AZ OFF

AZIMUTH : +- 0.00

ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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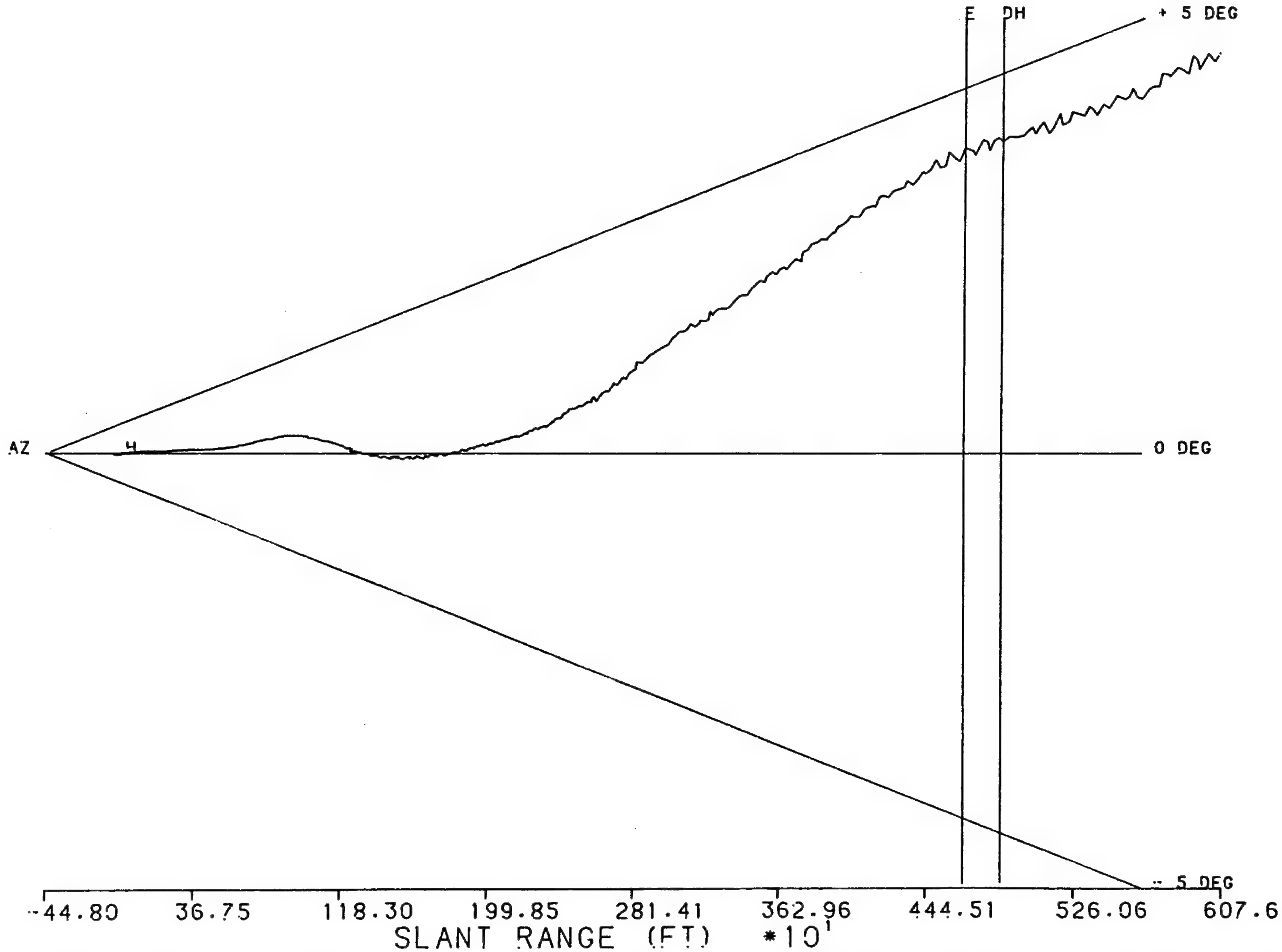

RUN # 5
5/25/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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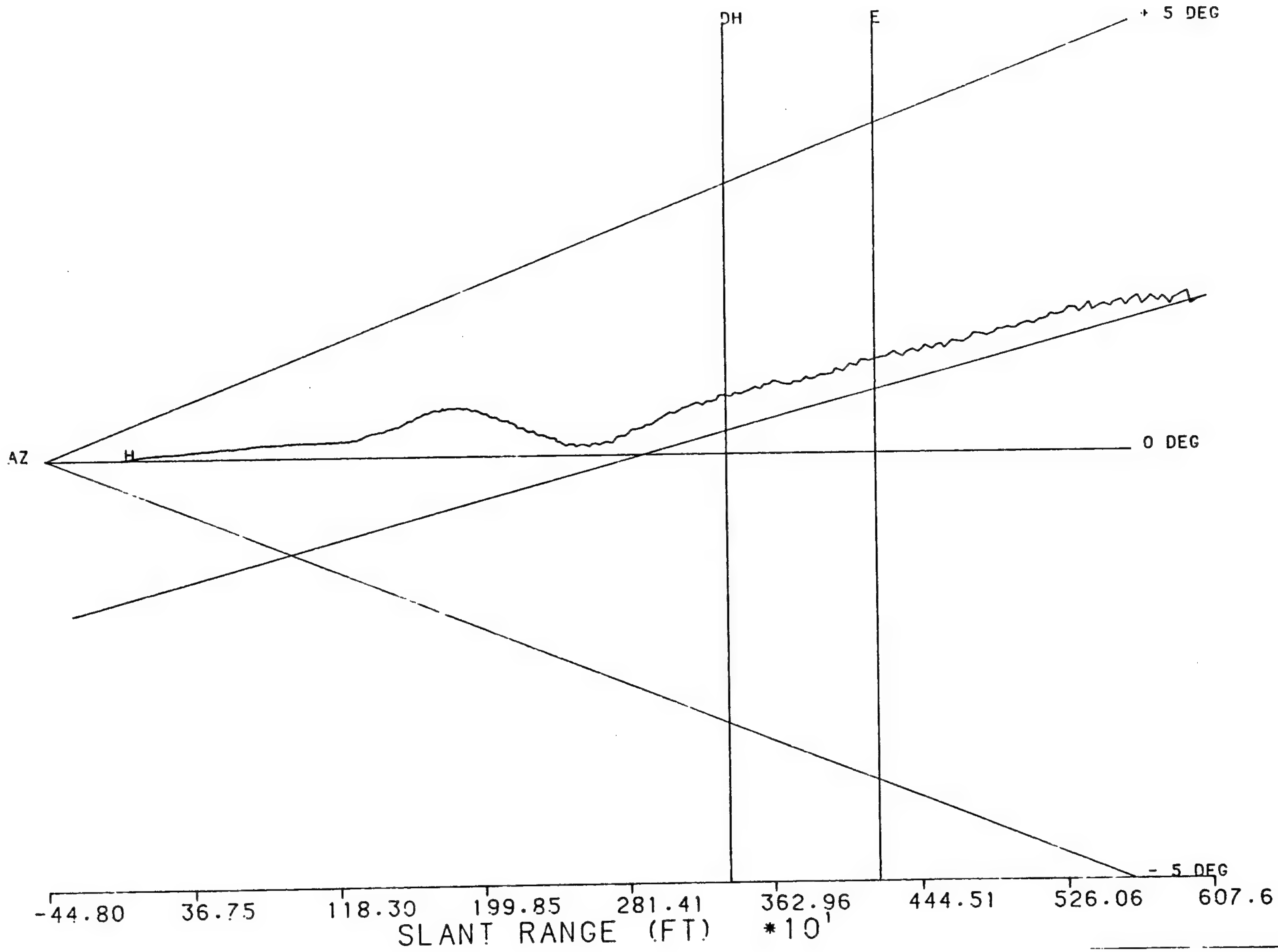
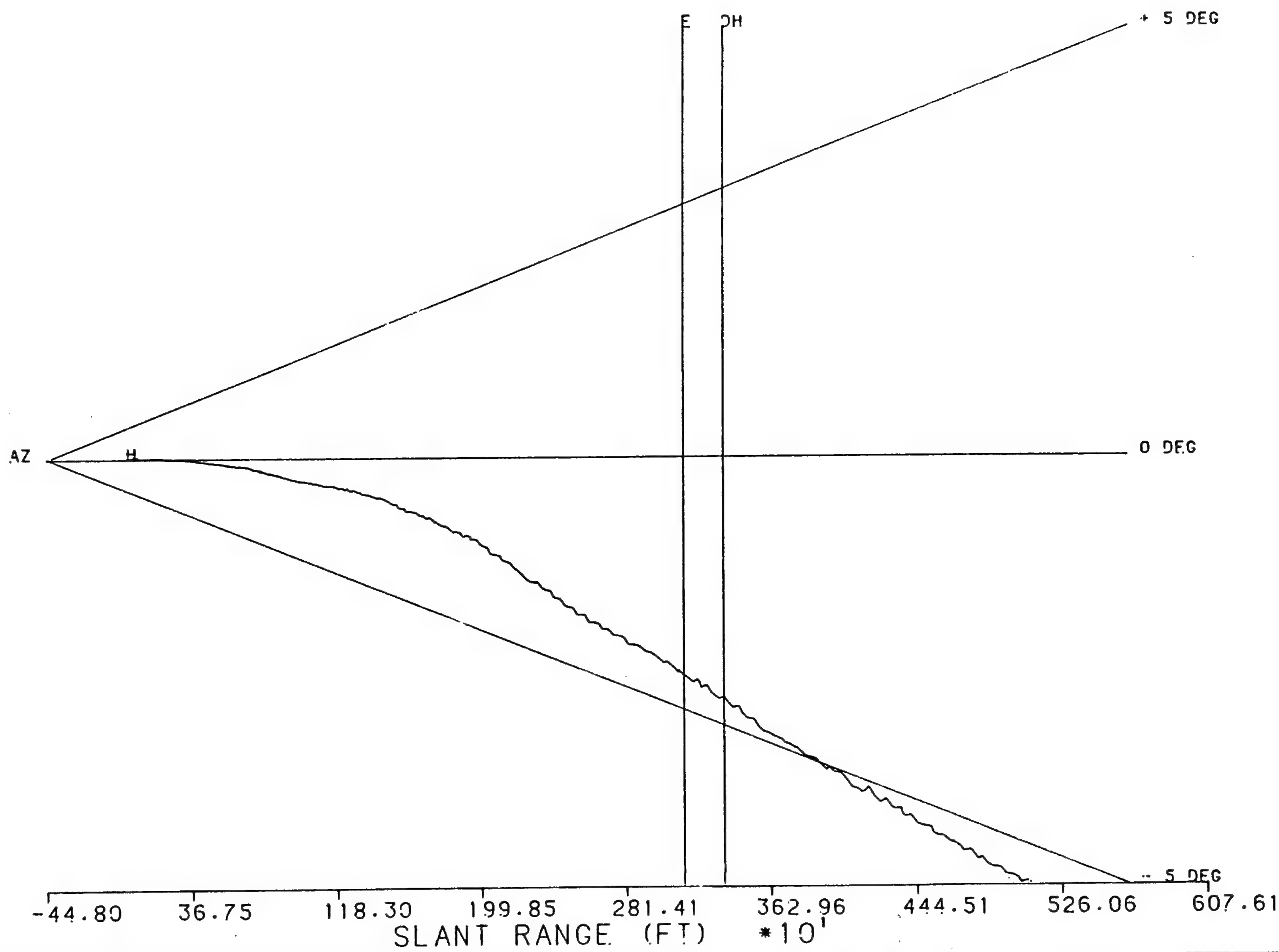


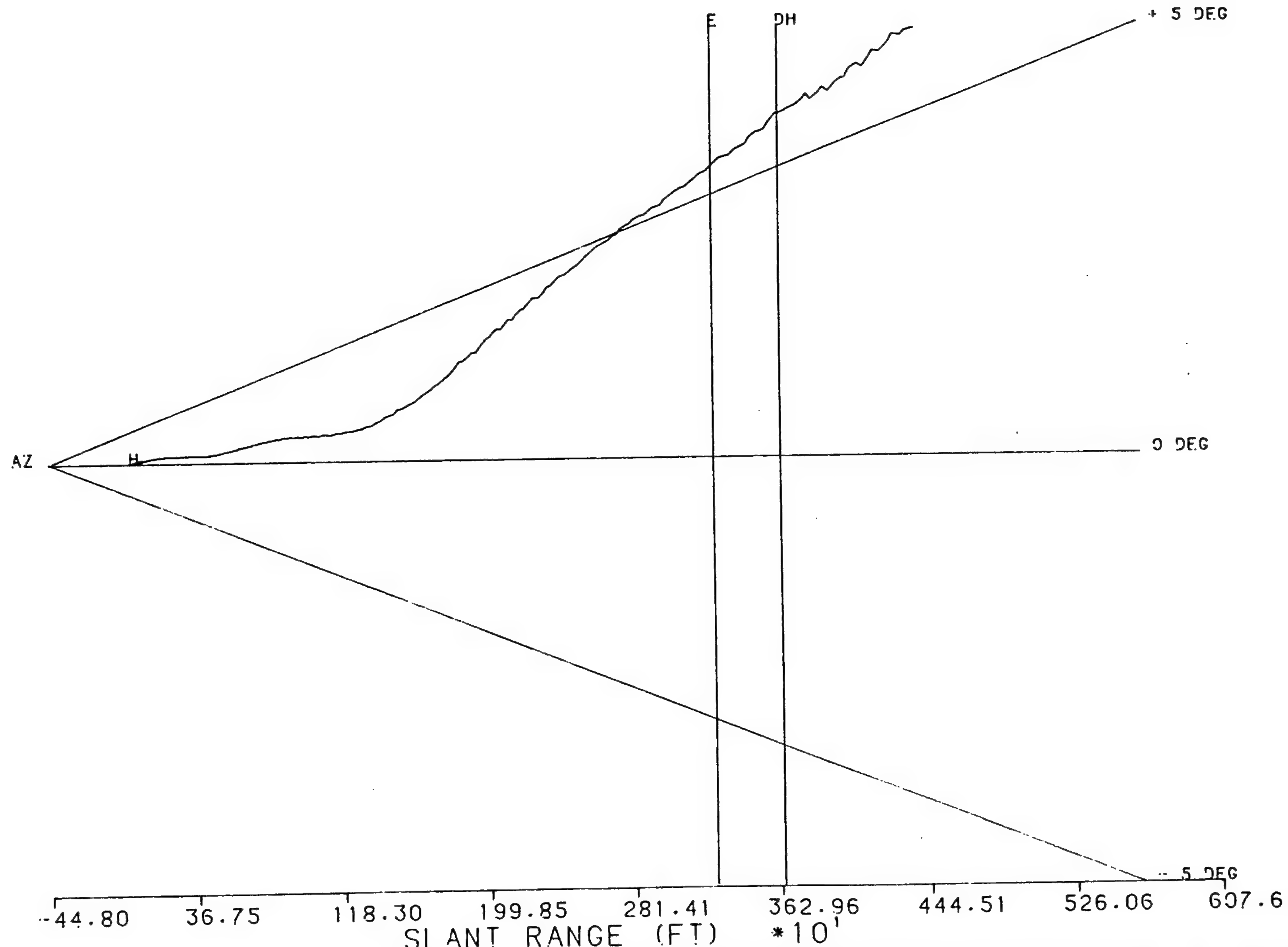
RUN # 6
5/25/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE R AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 7
5/25/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE L AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 8
5/25/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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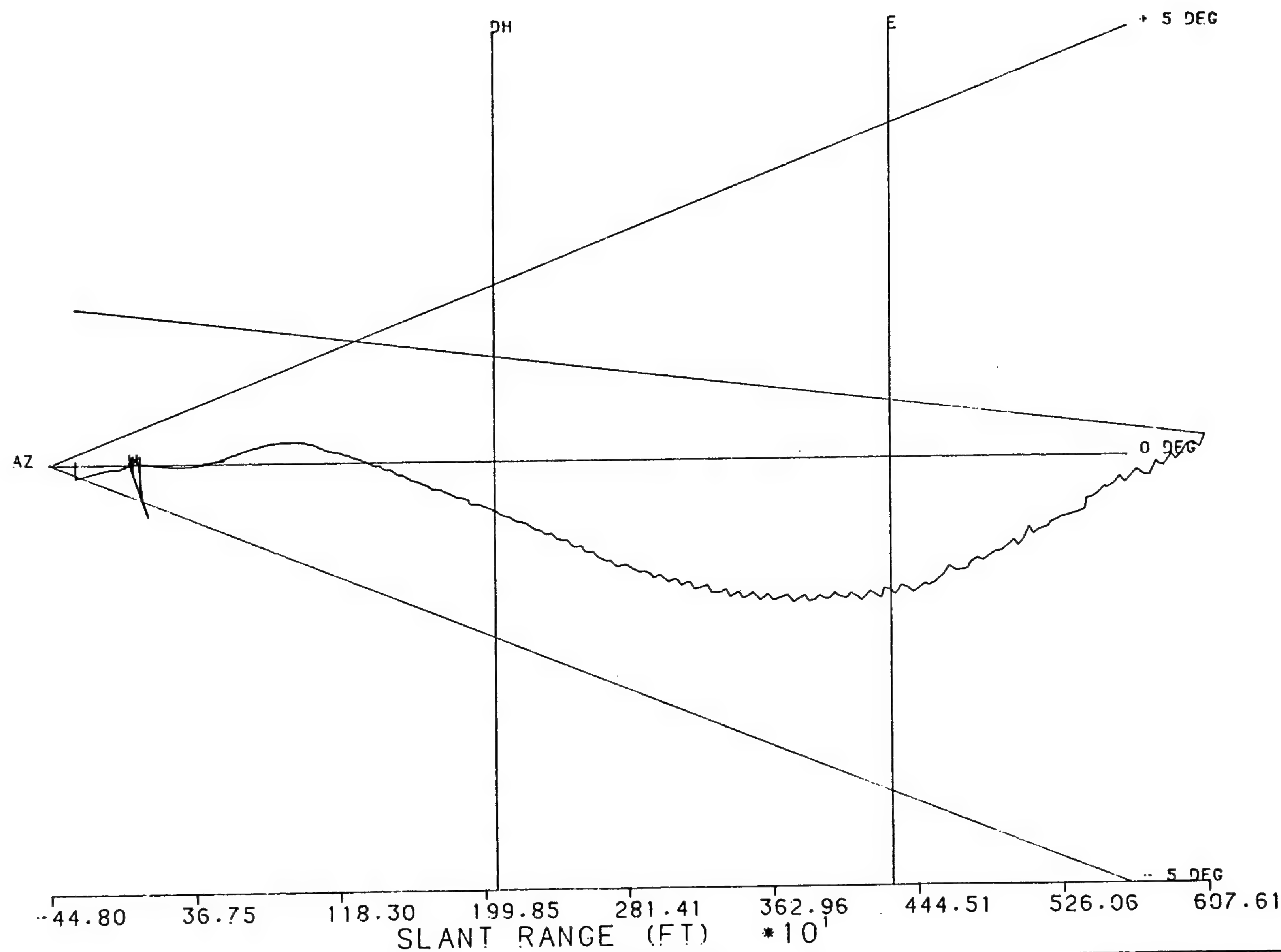

RUN # 9
5/25/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 5 DEGREE R AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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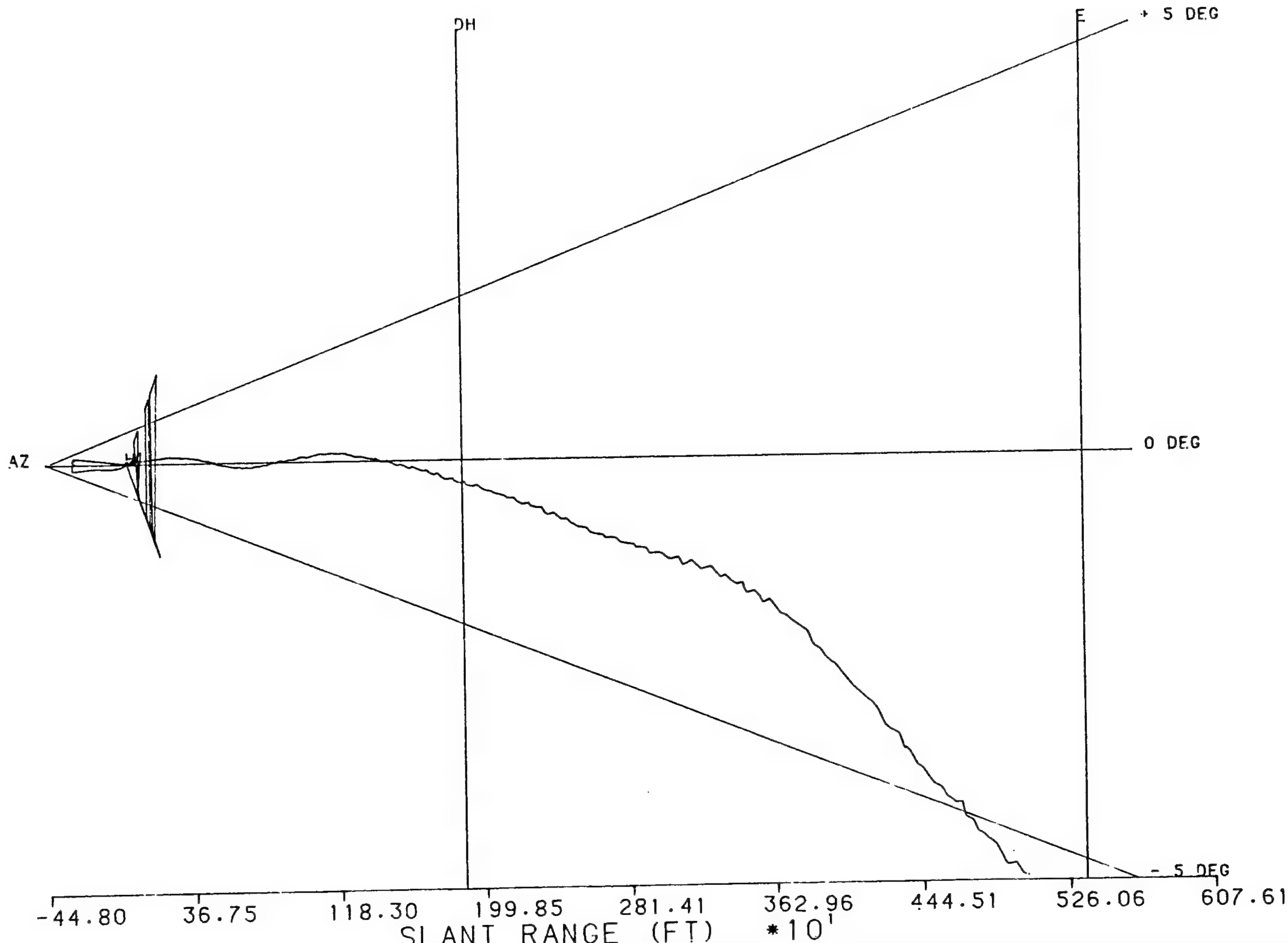
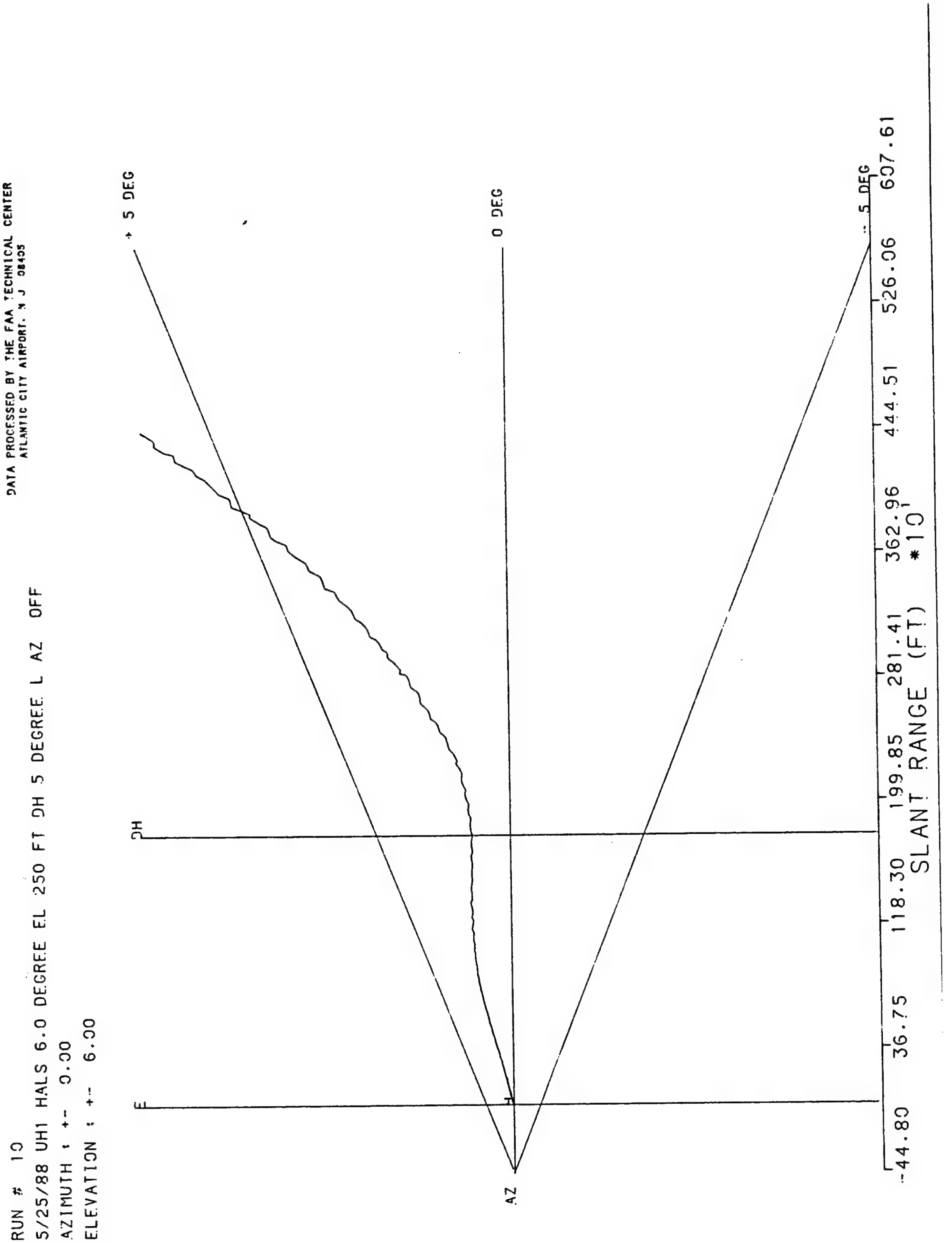
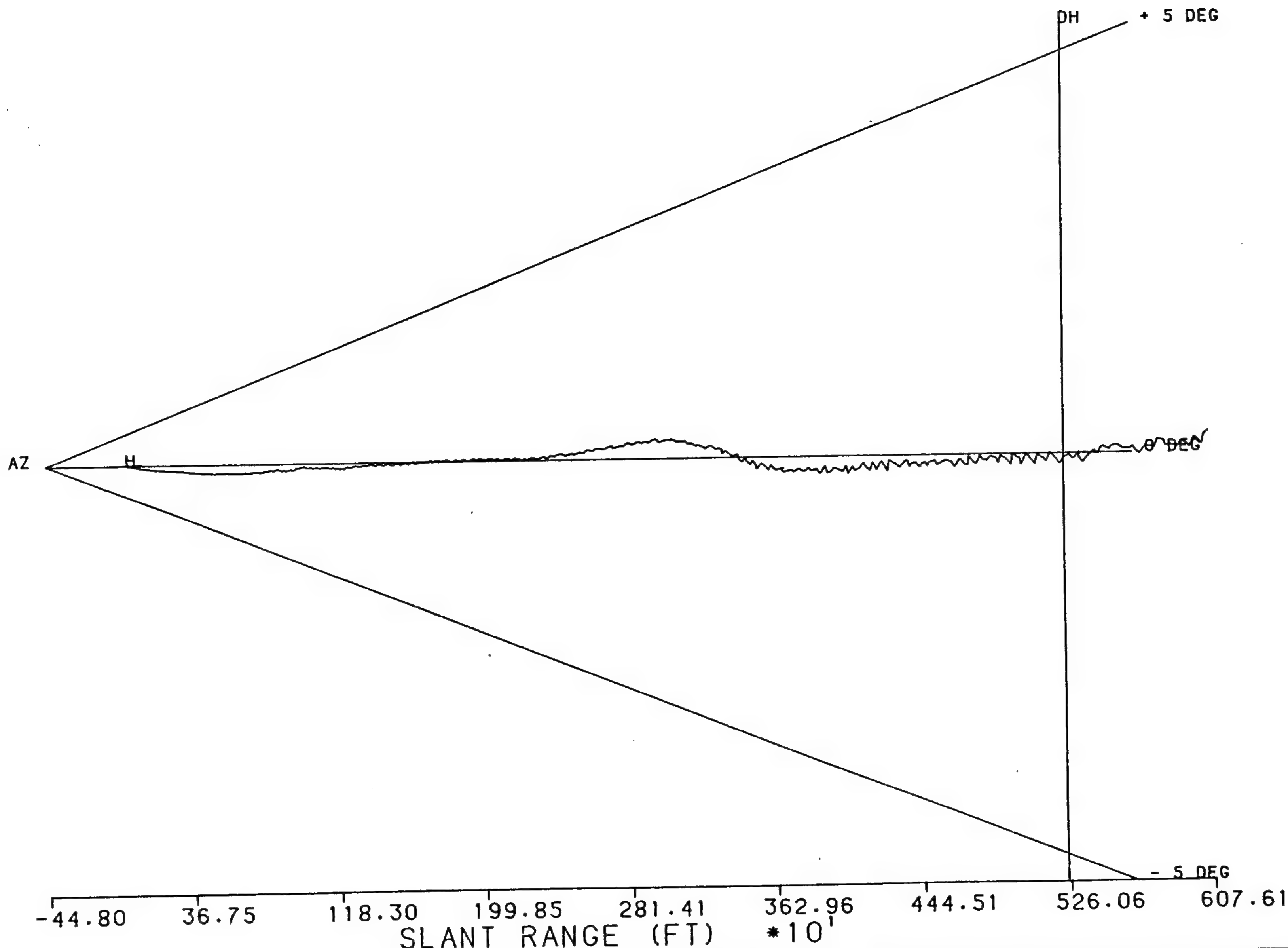



RUN # 10
5/25/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 5 DEGREE L AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 6.00
DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405
+ 5 DEG
0 DEG
- 5 DEG
DH
E
AZ
-44.80
36.75
118.30
199.85
281.41
362.96
444.51
526.06
607.61
SLANT RANGE (FT) *10[1]

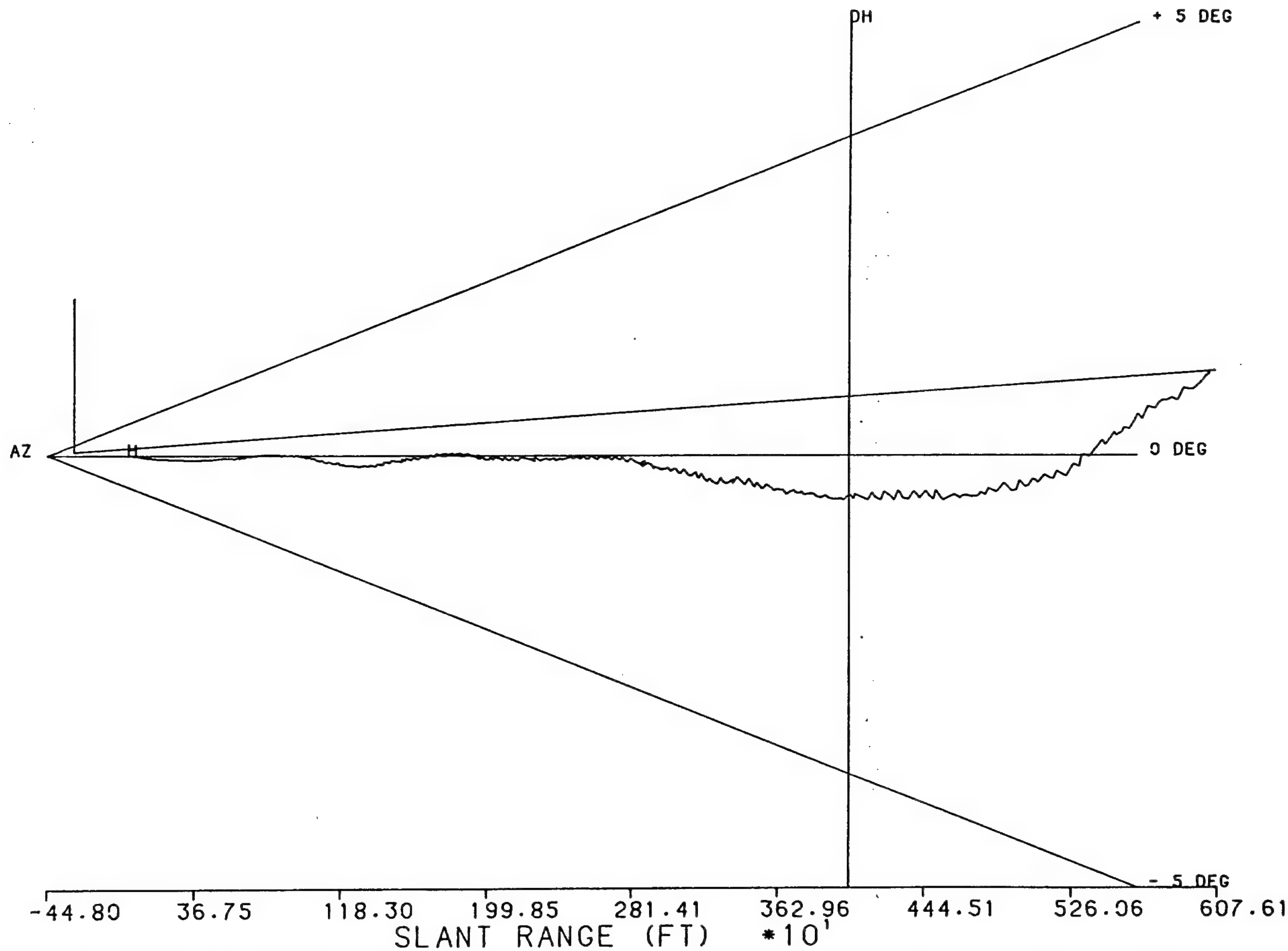
RUN # 1
5/11/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



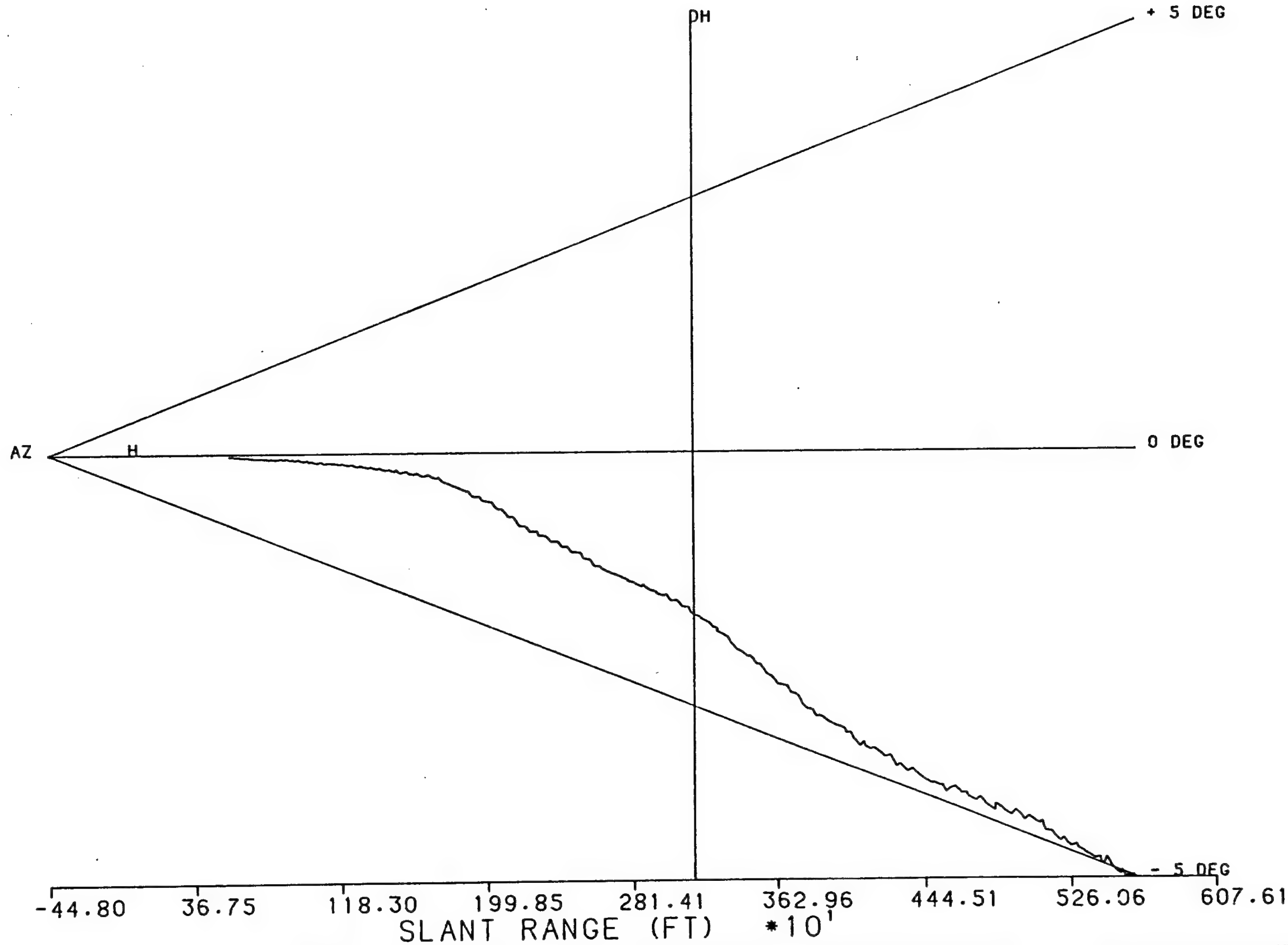
RUN # 2
5/11/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 3
5/11/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 5 DEGREE R AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 4
5/11/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 5 DEGREE L AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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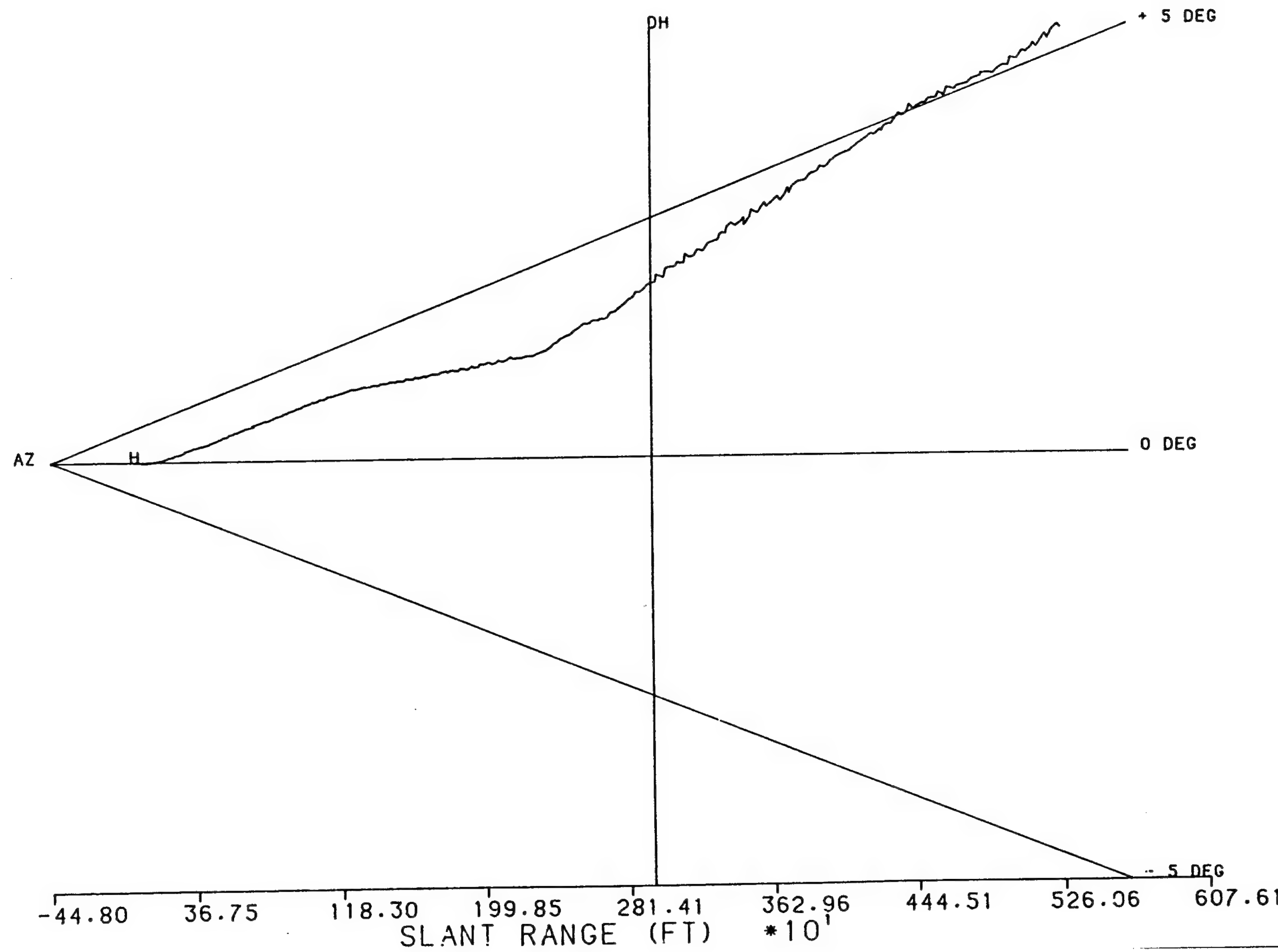
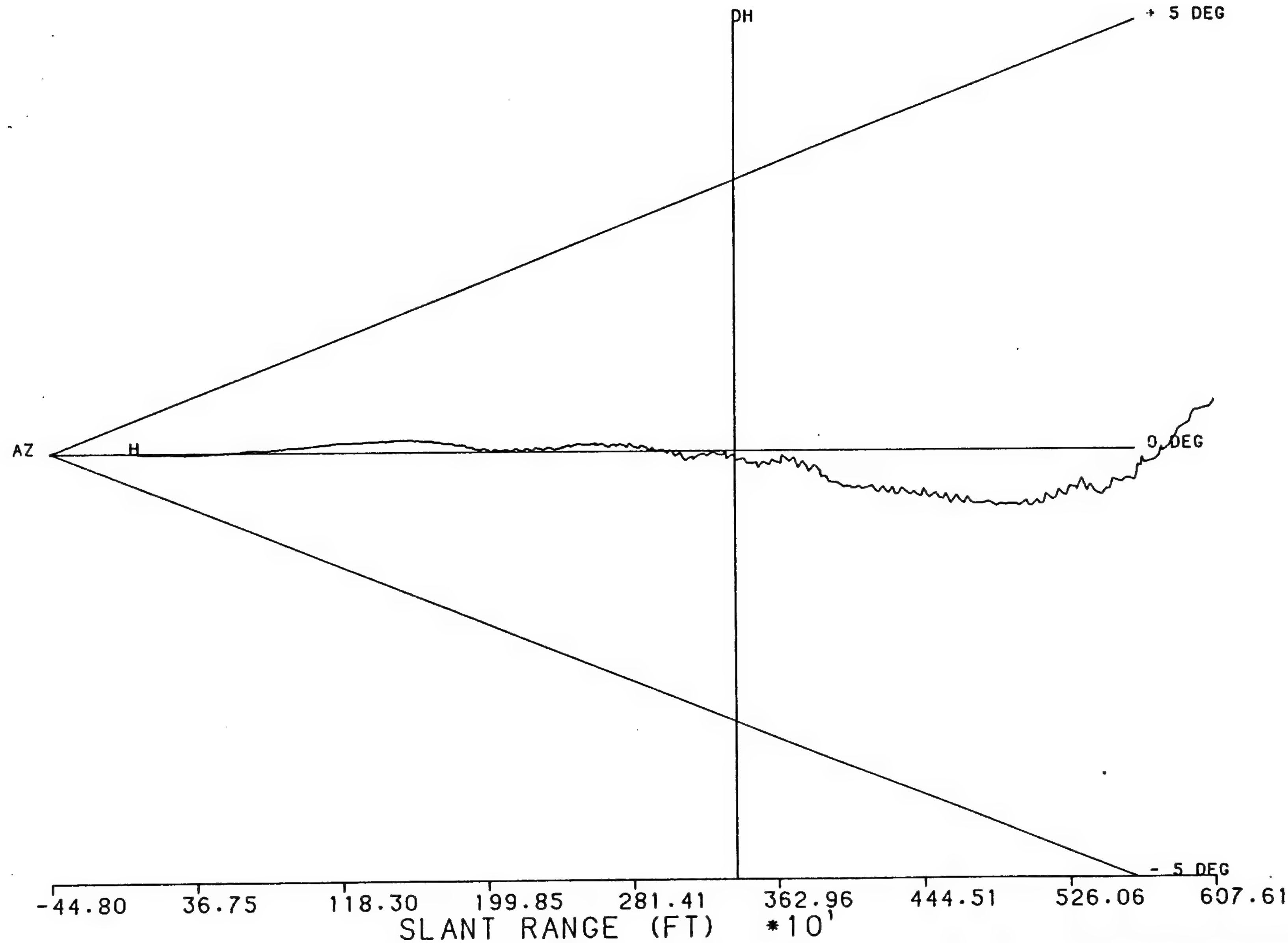


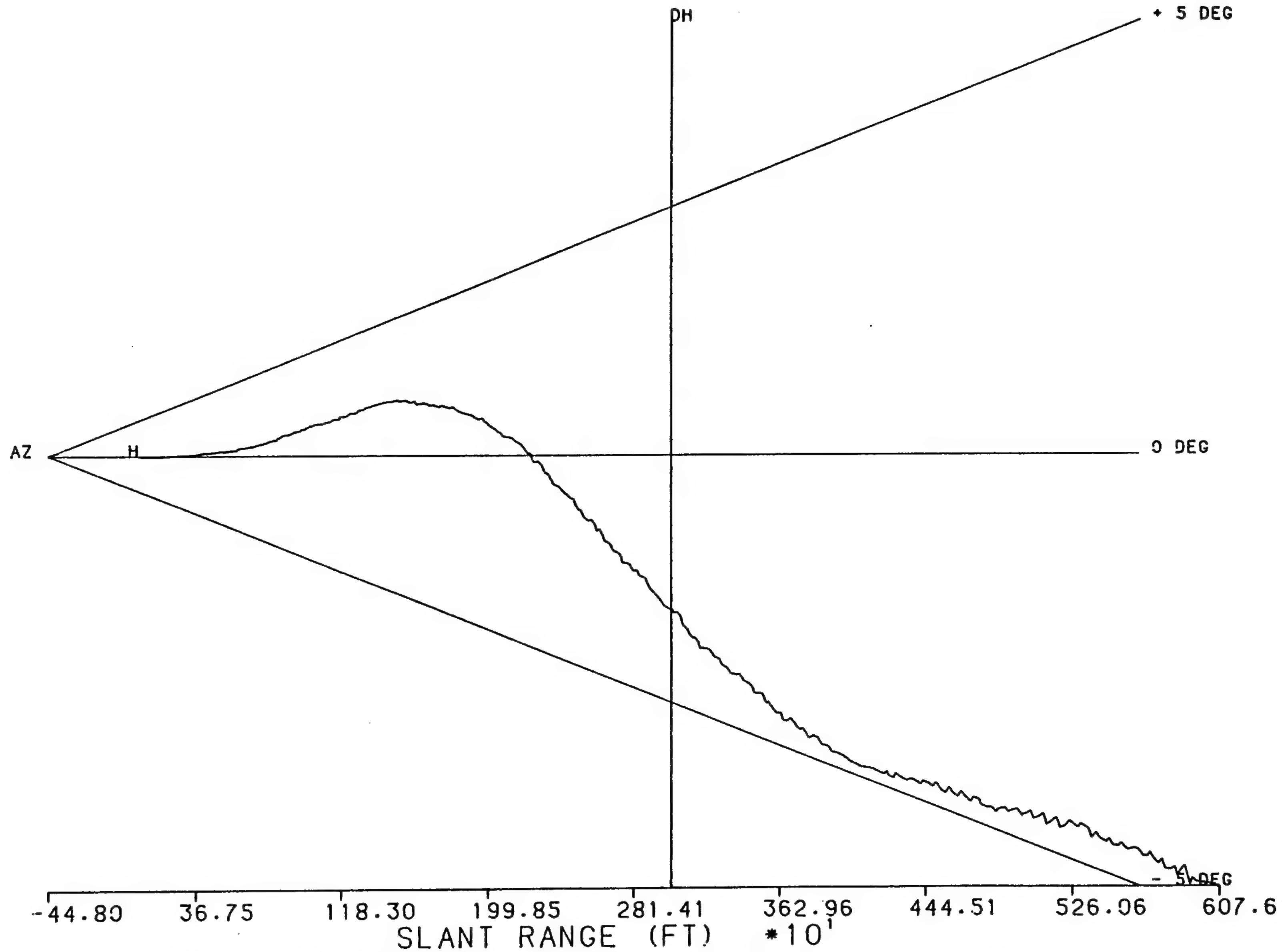
RUN # 5
5/11/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 6
5/11/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE R AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 7
5/11/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE L AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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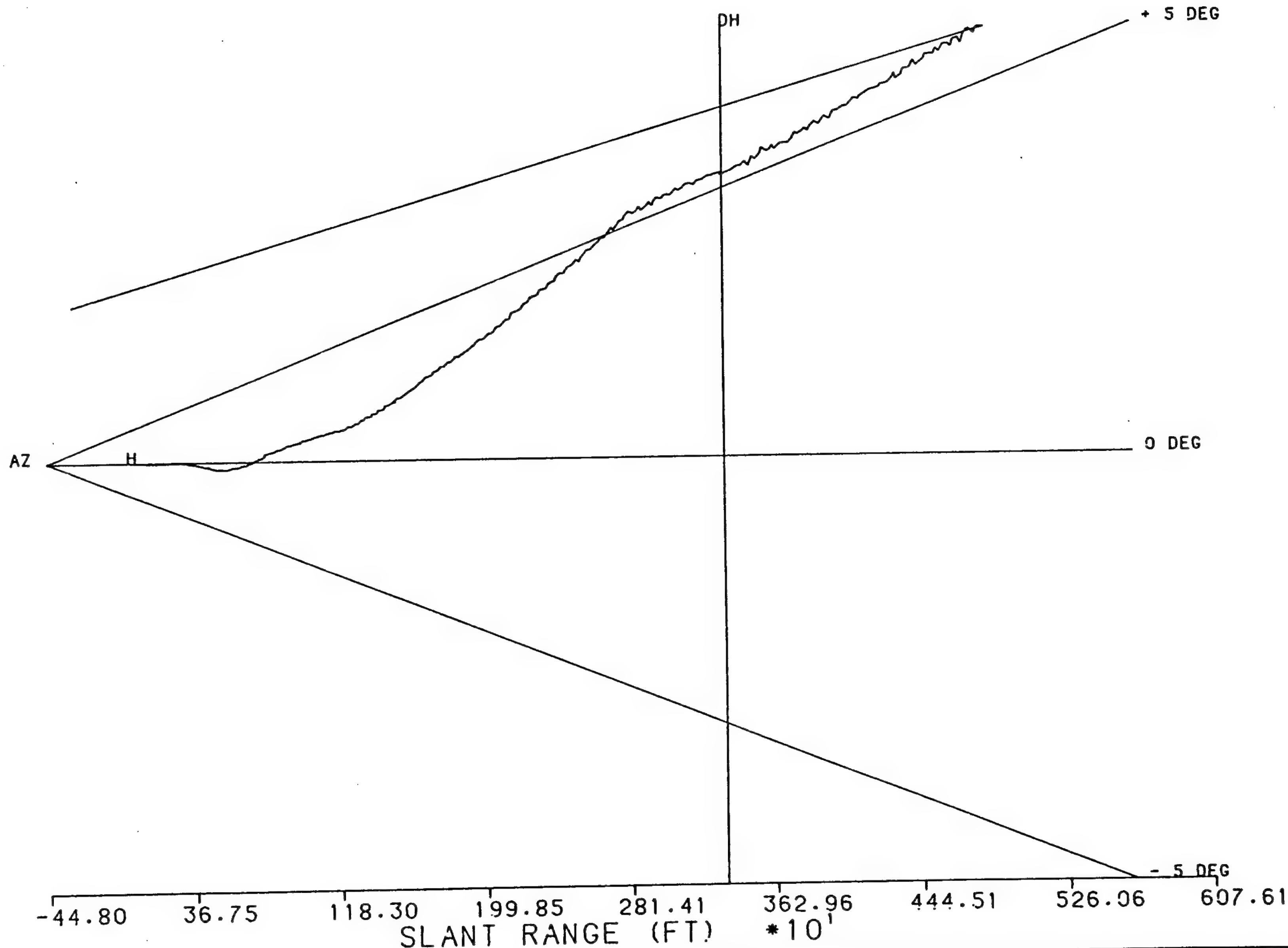
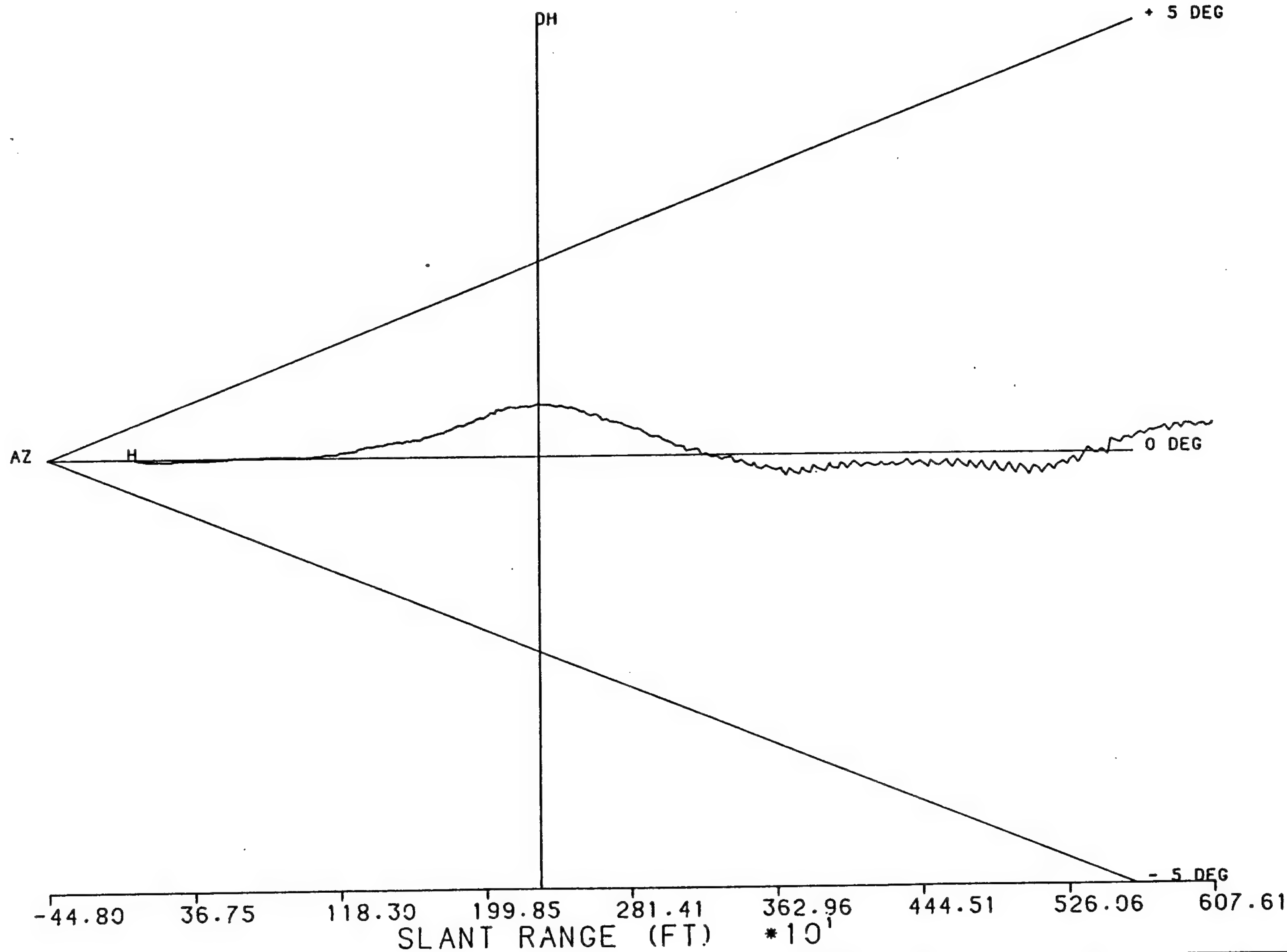


RUN # 8
5/11/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 9
5/11/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 5 DEGREE R AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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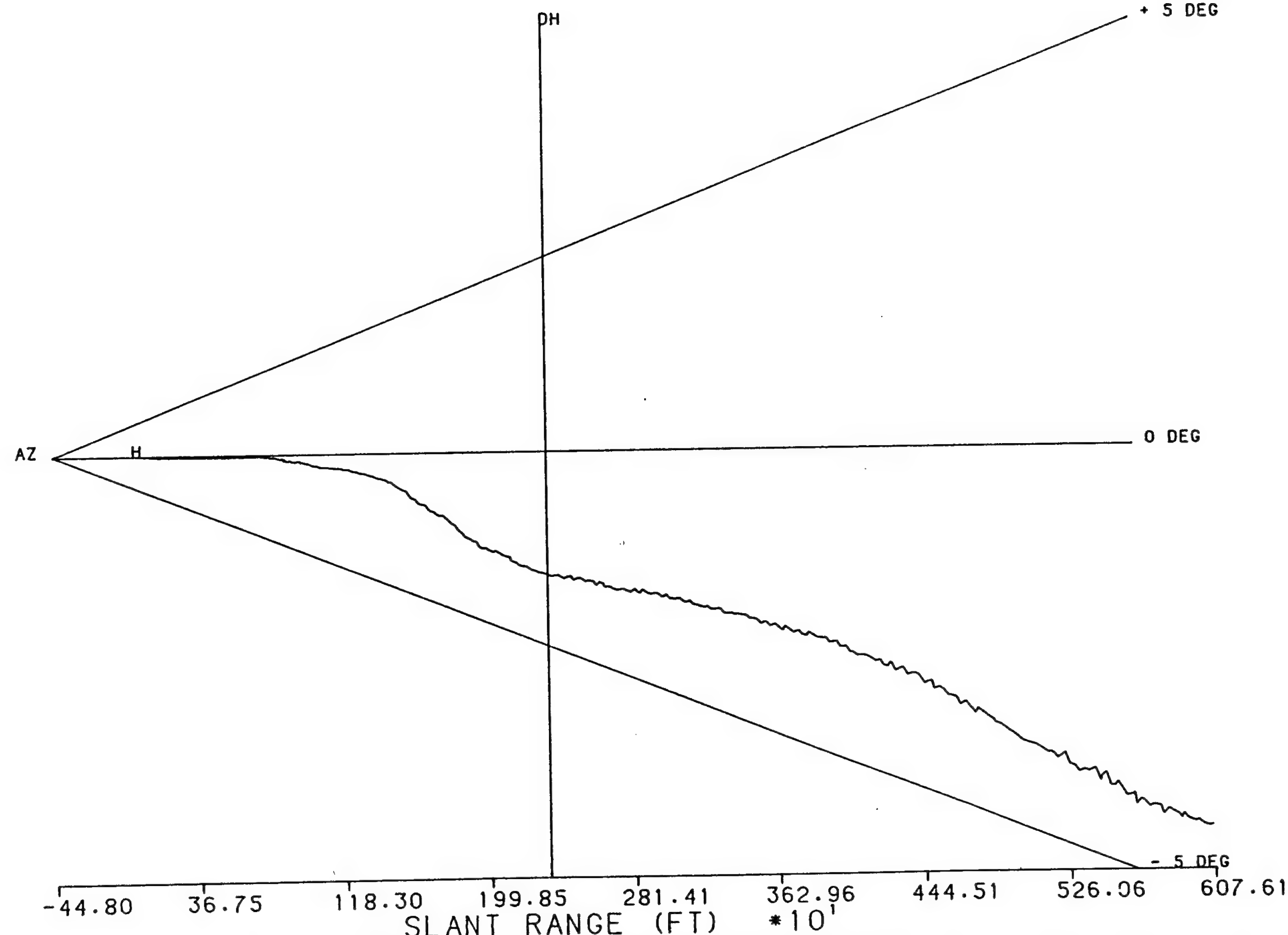
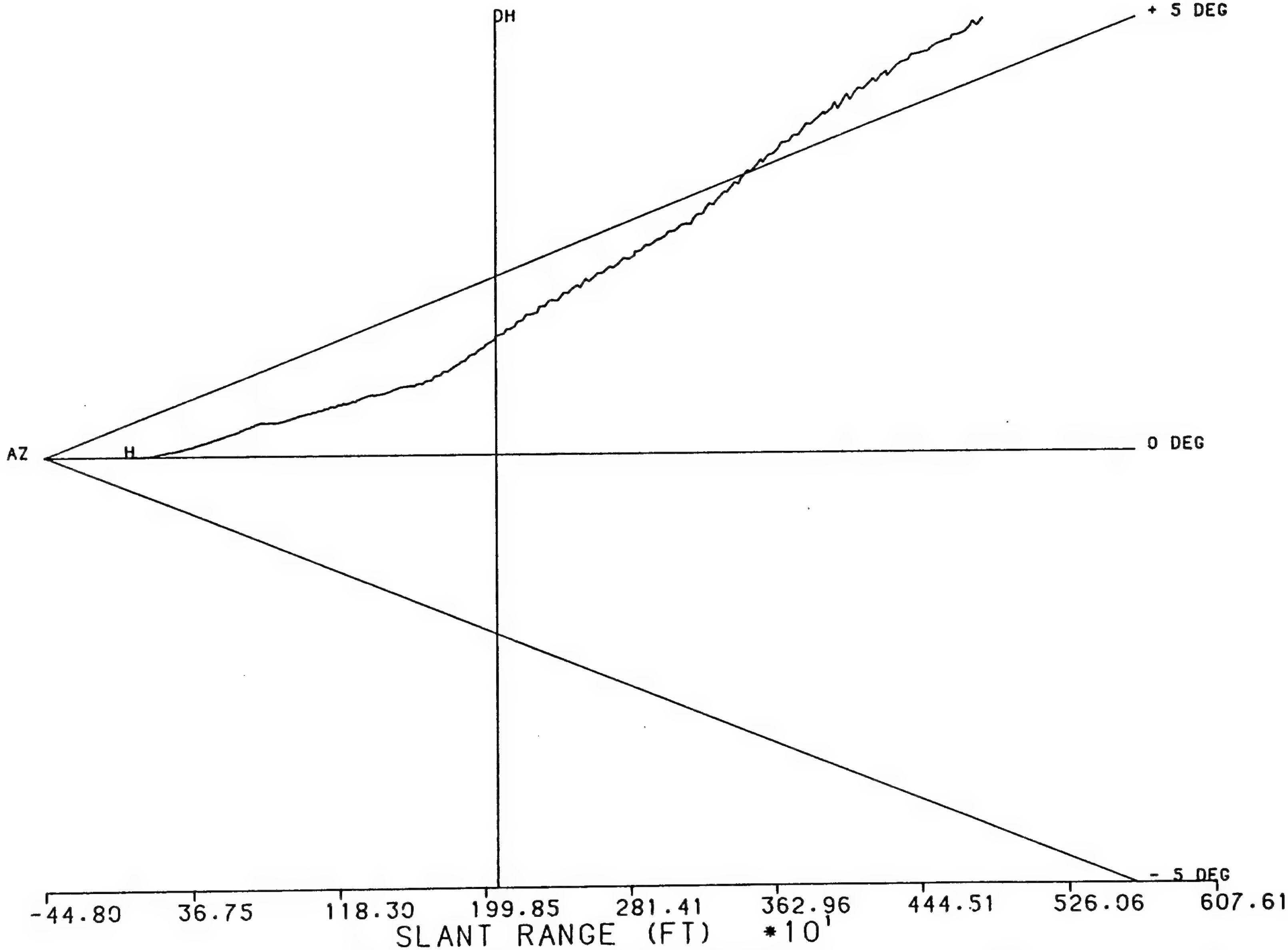


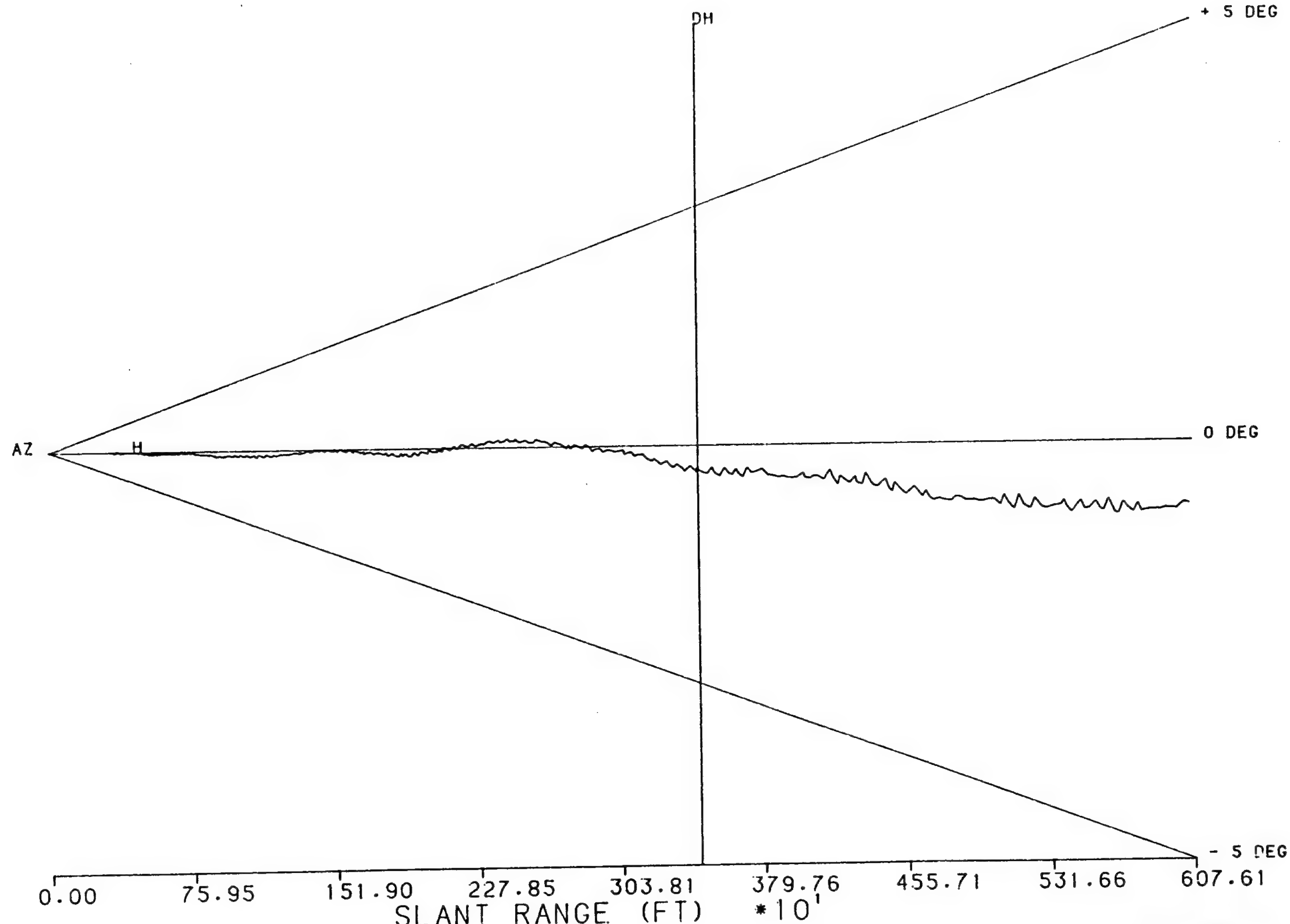
RUN # 10
5/11/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 5 DEGREE L AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



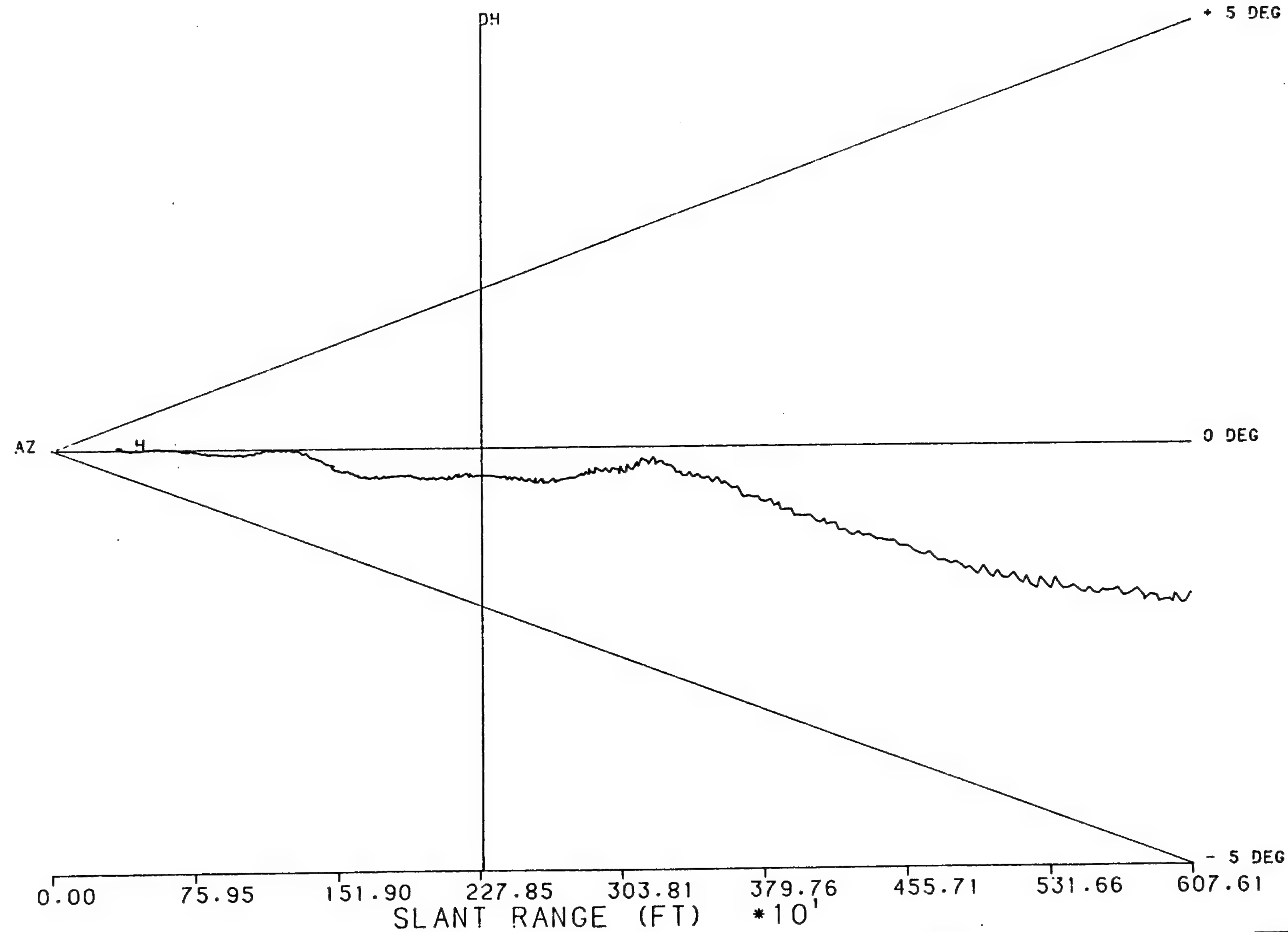
RUN # 1
4/28/88 UH1 HALS 3 DEGREE EL 200 FT DH 143 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



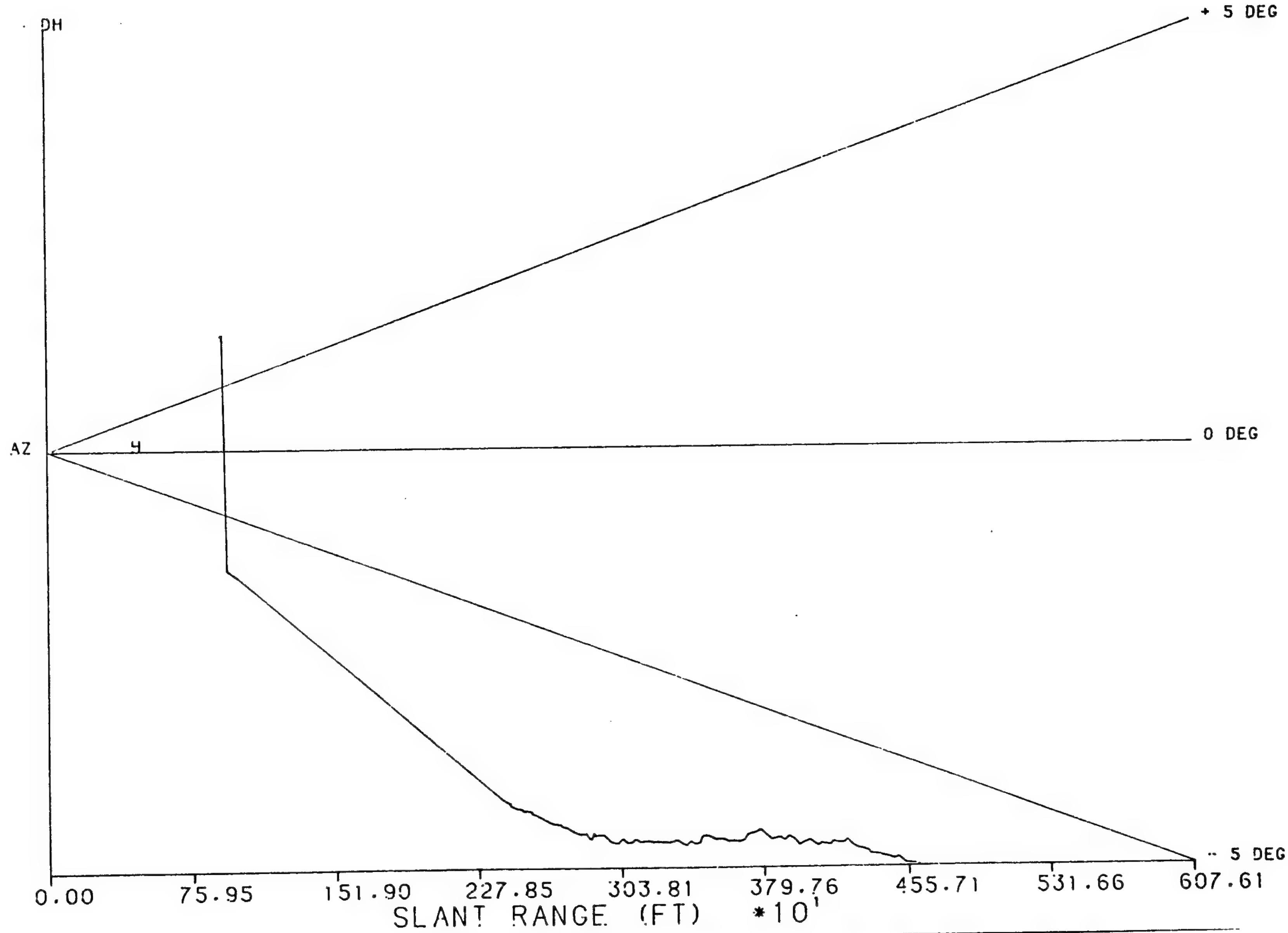
RUN # 2
4/28/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 143 DEGREE AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 3
4/28/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 138 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 4
4/28/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 148 DEGREE AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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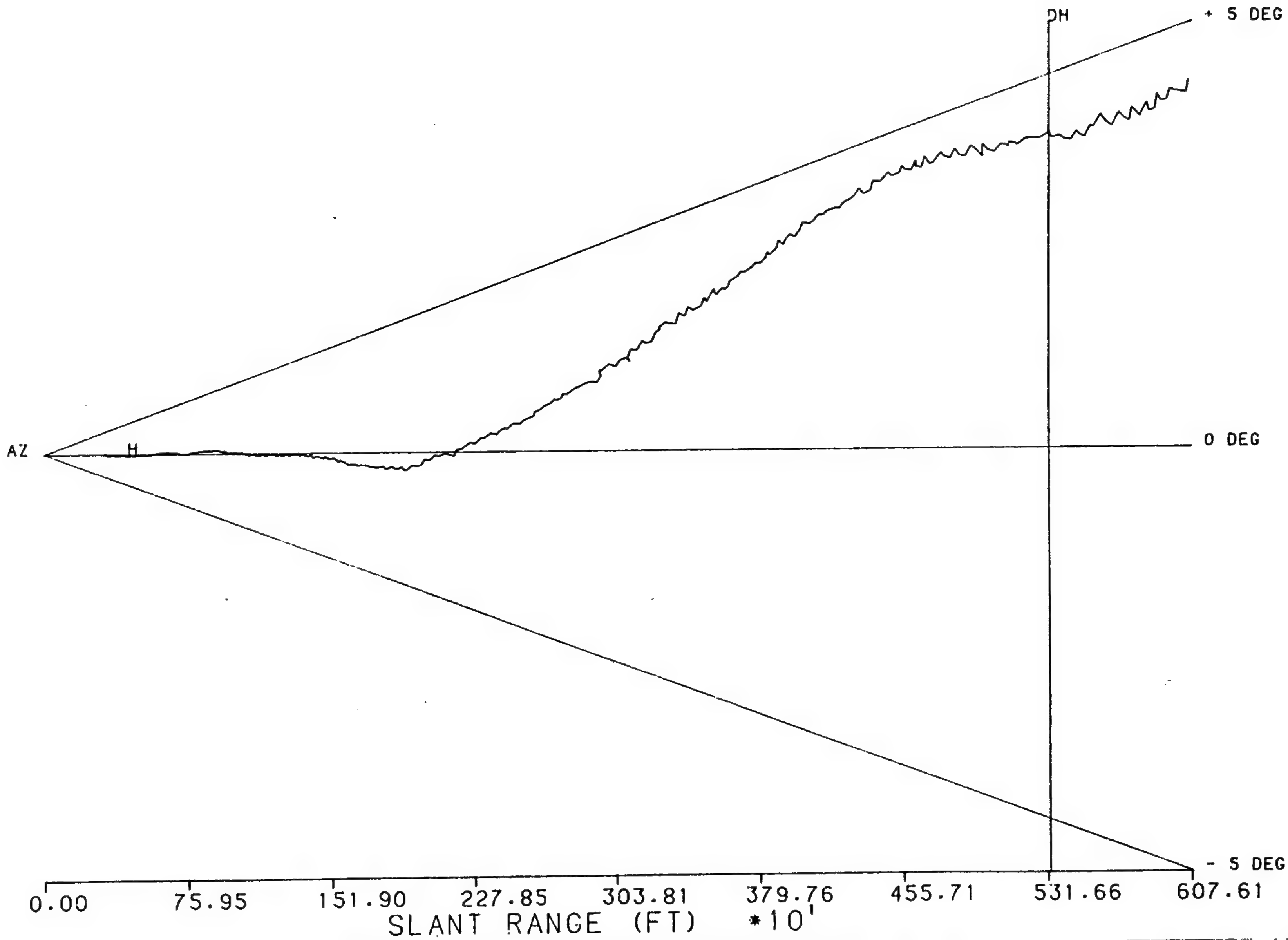

RUN # 5
4/28/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 143 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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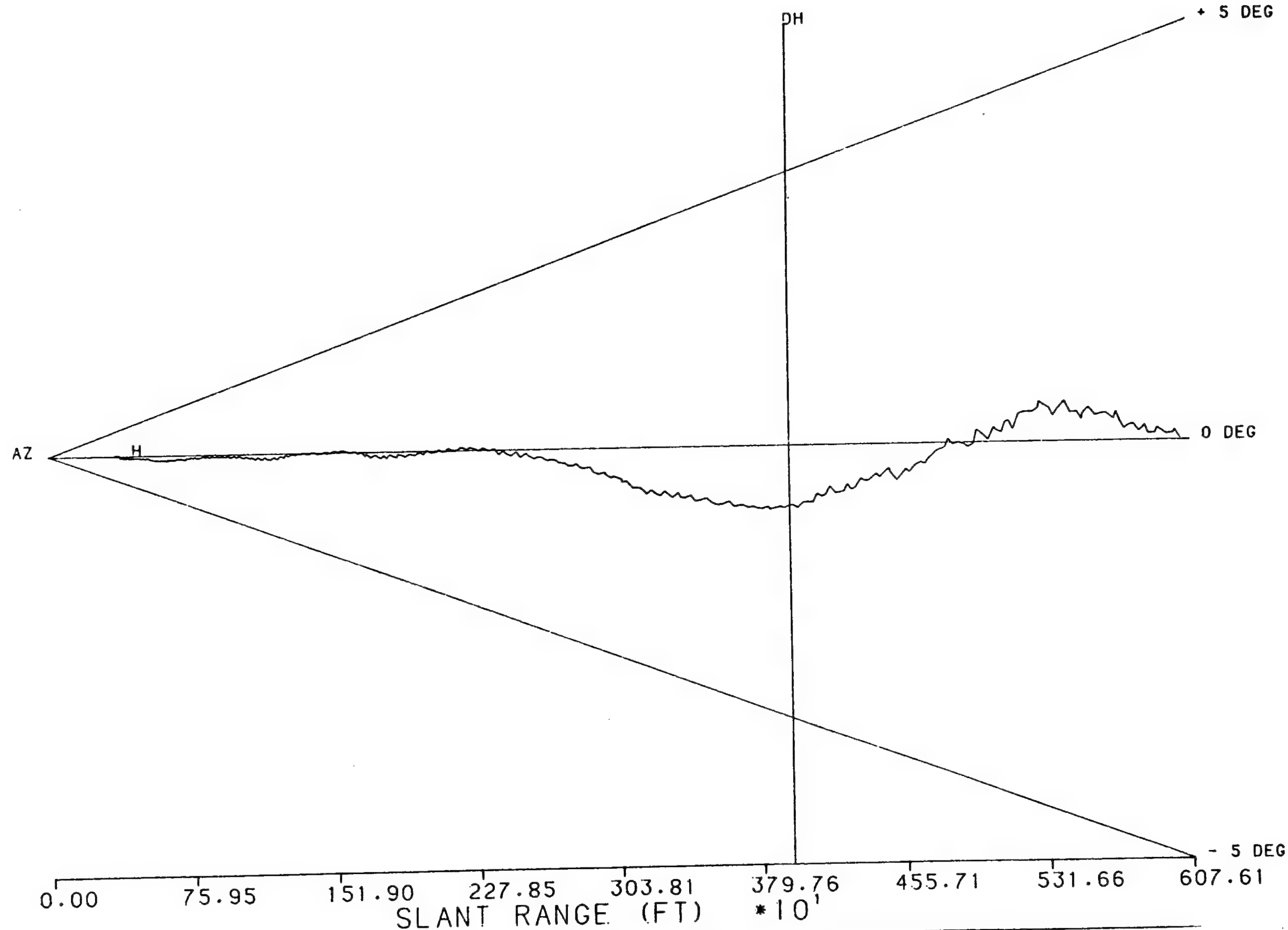

RUN # 6
4/28/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 138 DEGREE AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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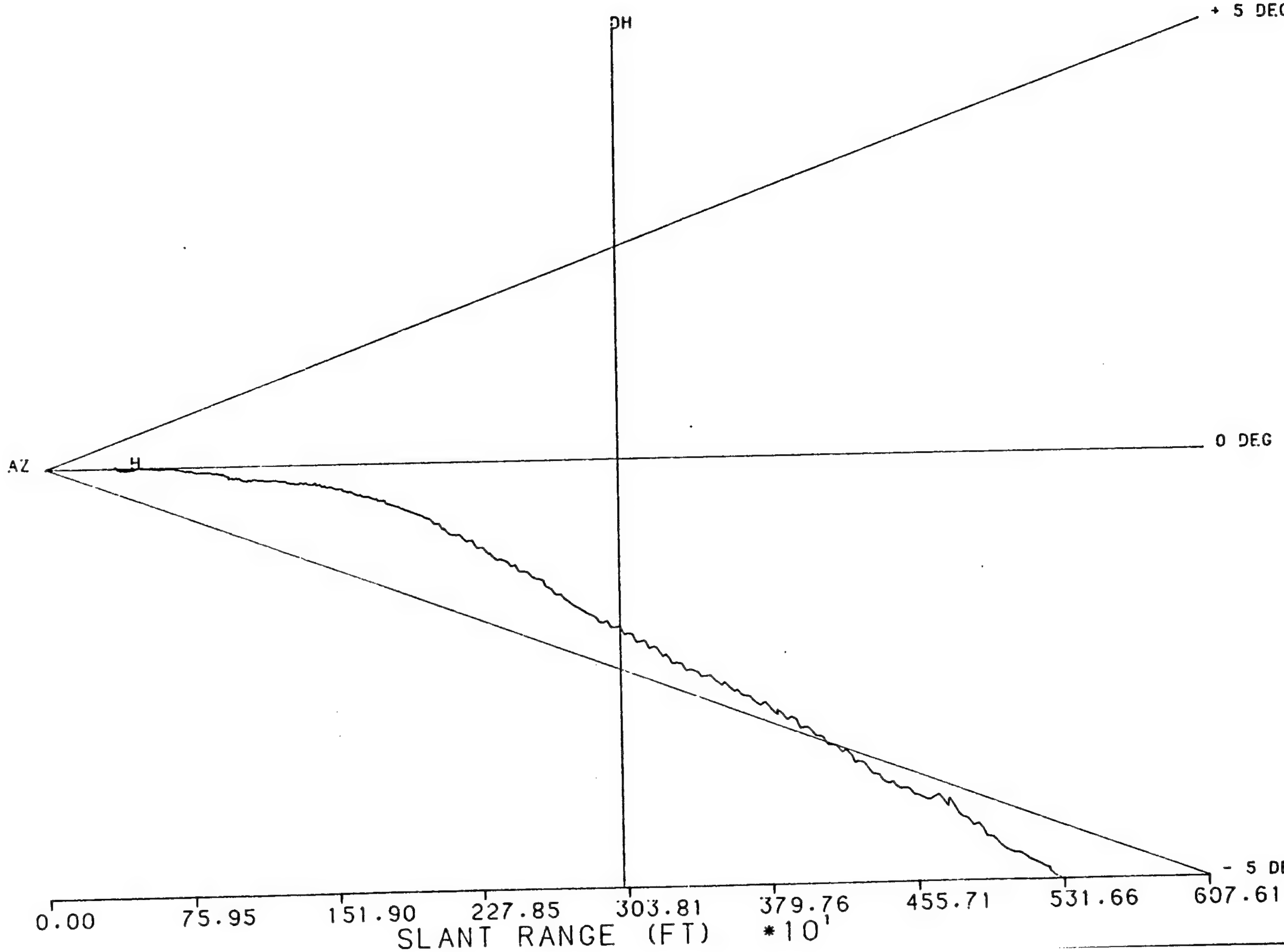

RUN # 7
4/28/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 148 DEGREE AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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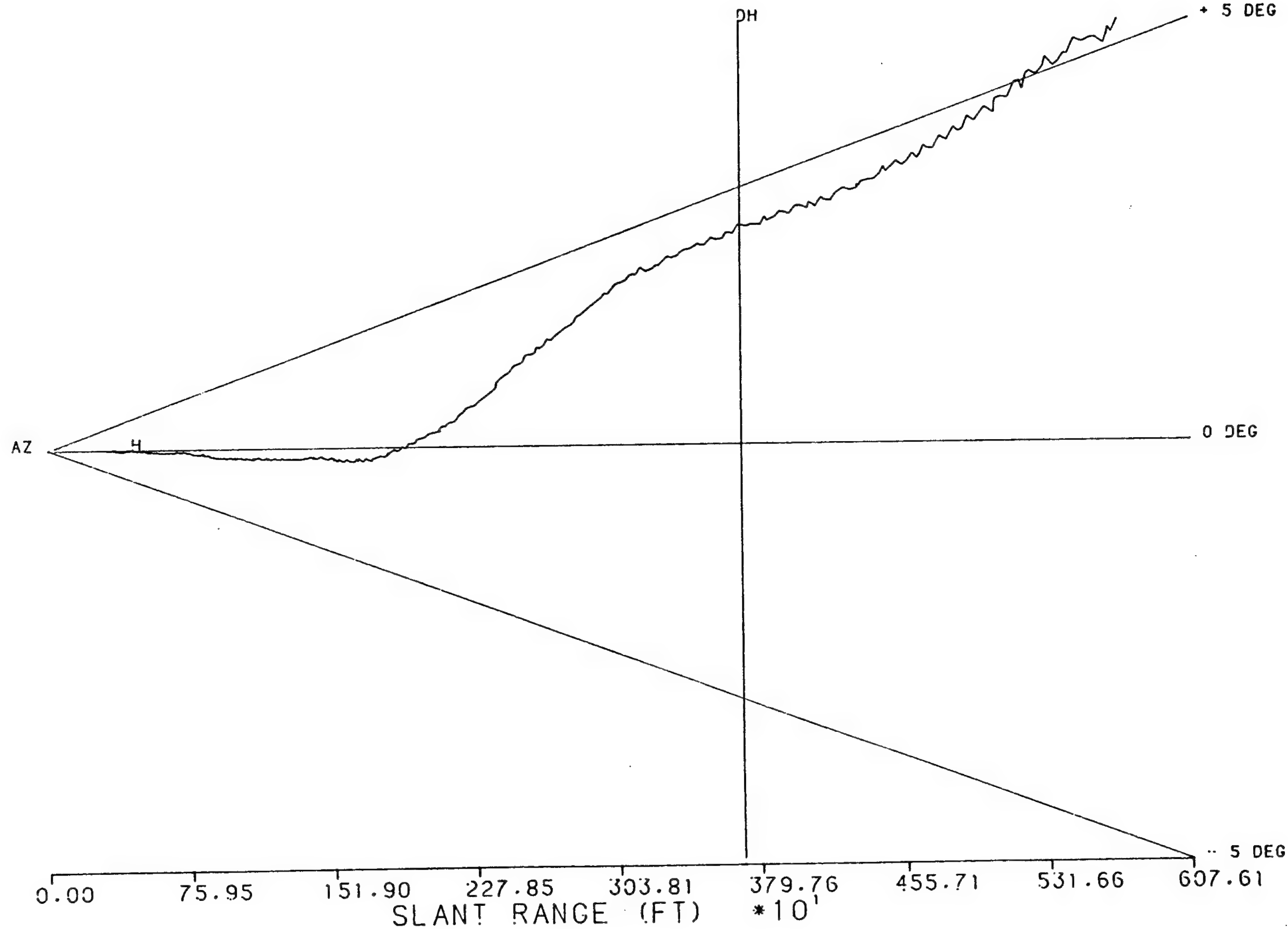

RUN # 8
4/28/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 143 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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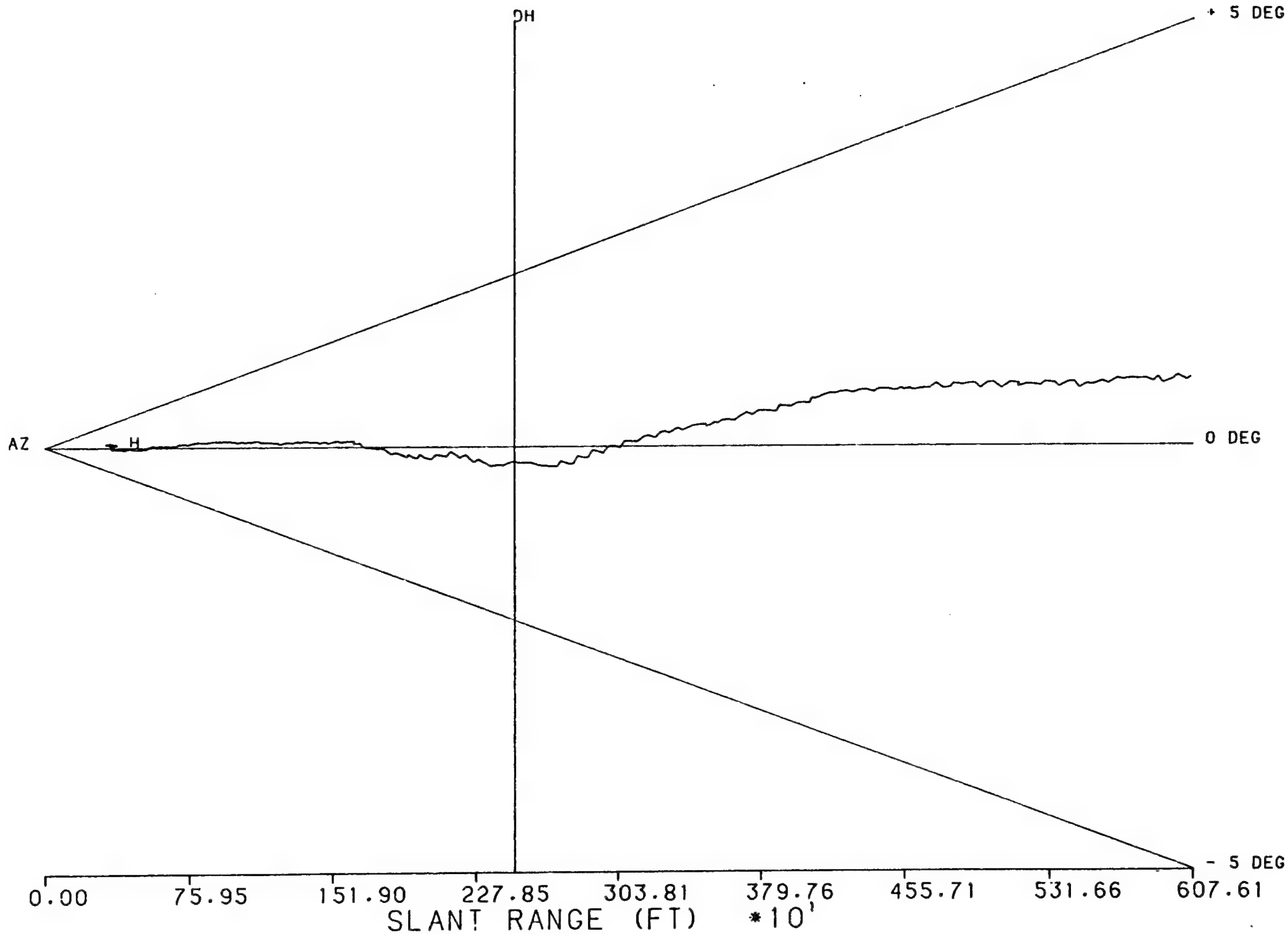

RUN # 9
4/28/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 138 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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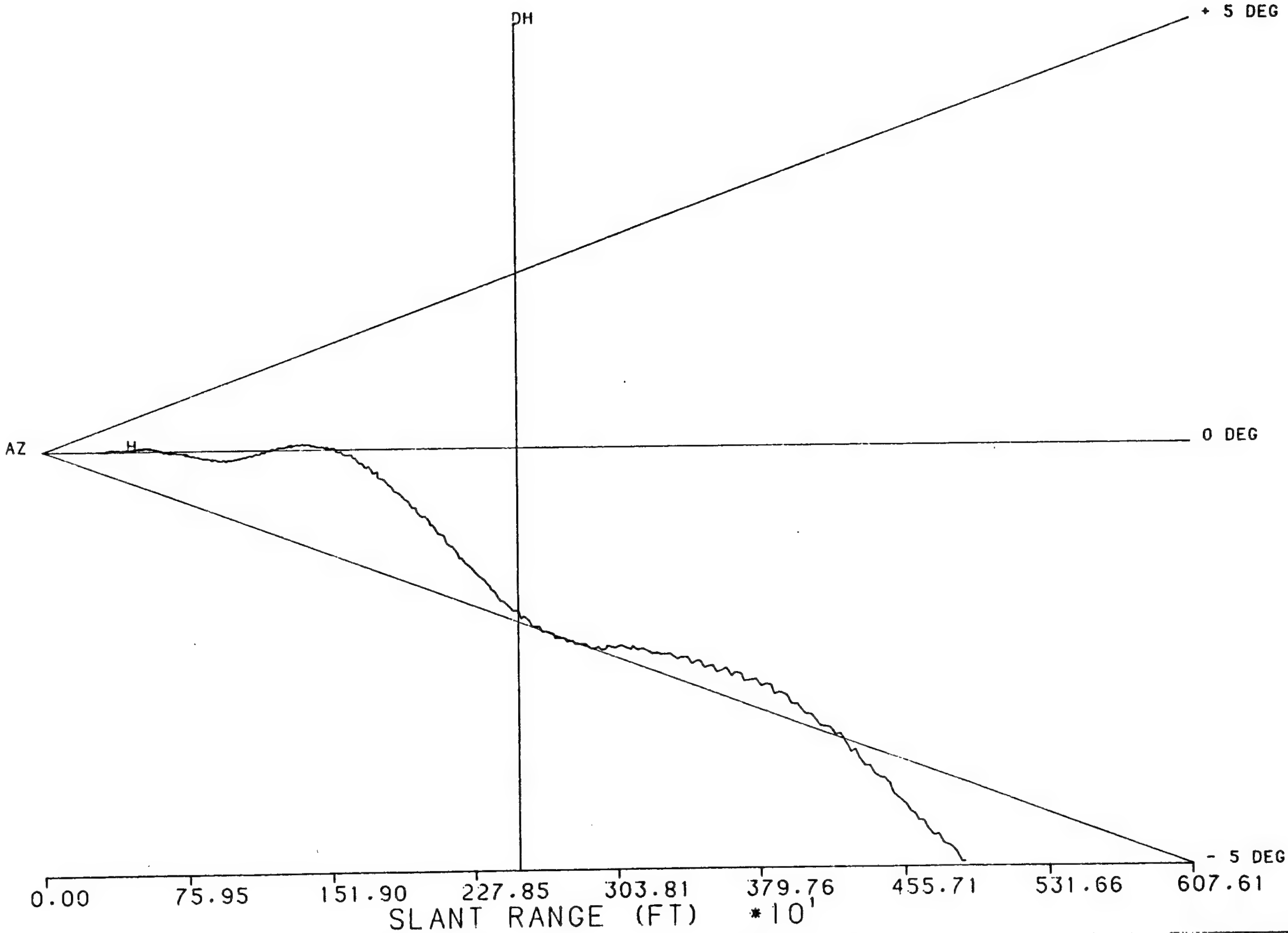

RUN # 10
4/28/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 148 DEGREE AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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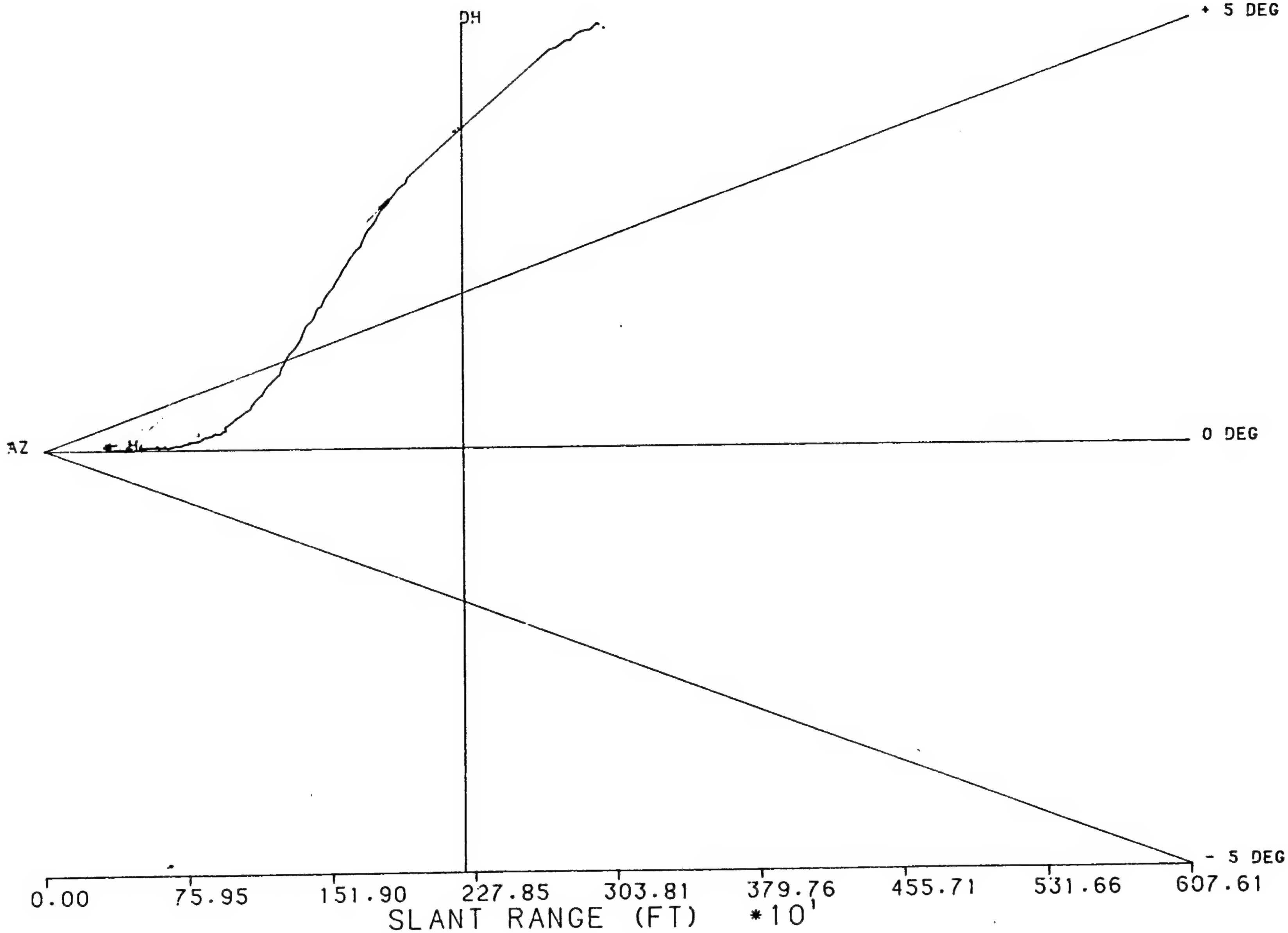

RUN # 1
4/26/88 UH1 HALS 3 DEGREE EL 200 FT DH 143 DEGREE AZ ON STE
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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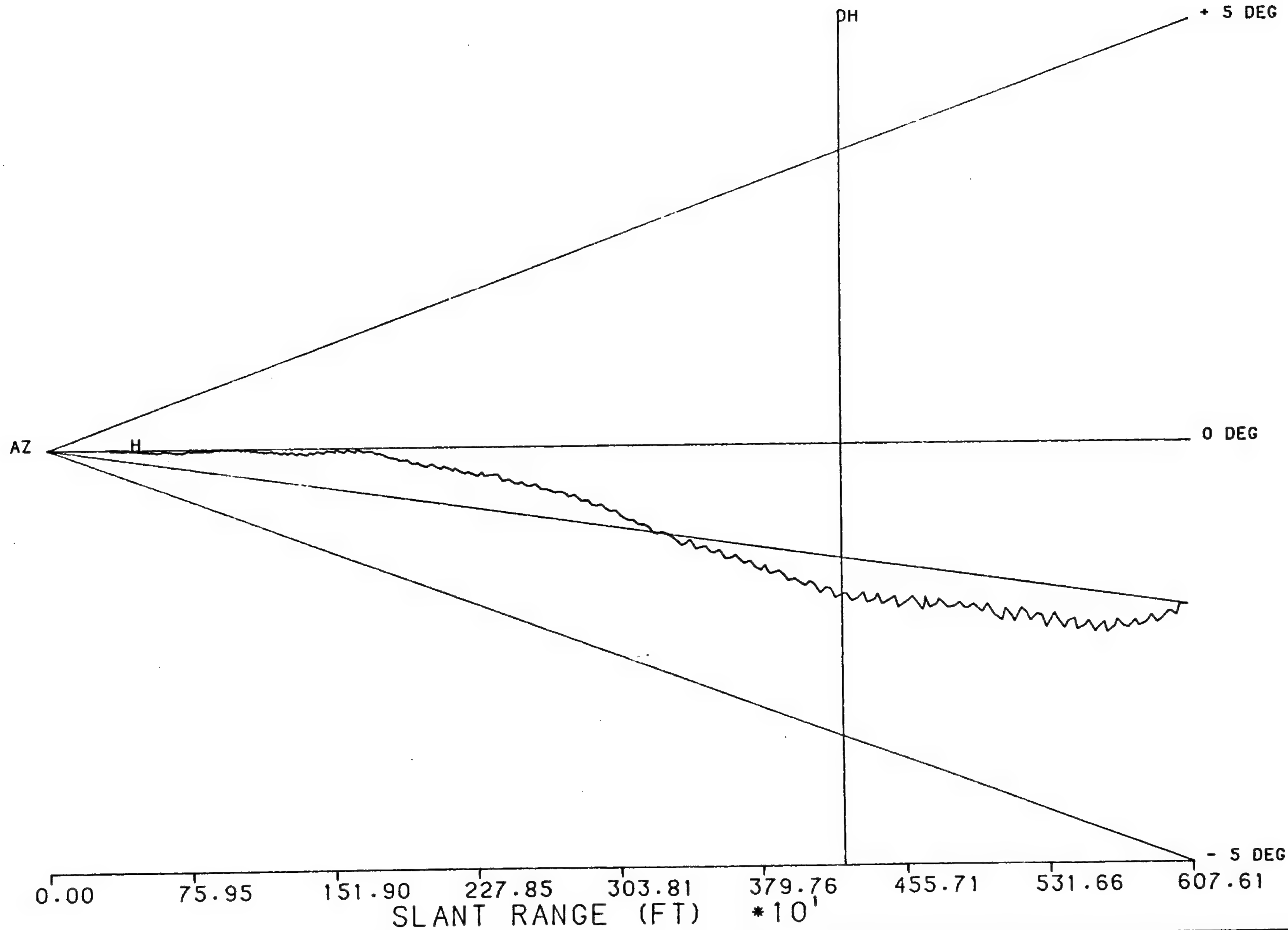

RUN # 2

4/26/88 UH1 HALS 3 DEGREE EL 200 FT DH 143 DEGREE AZ OFF ST 2

AZIMUTH : +- 0.00

ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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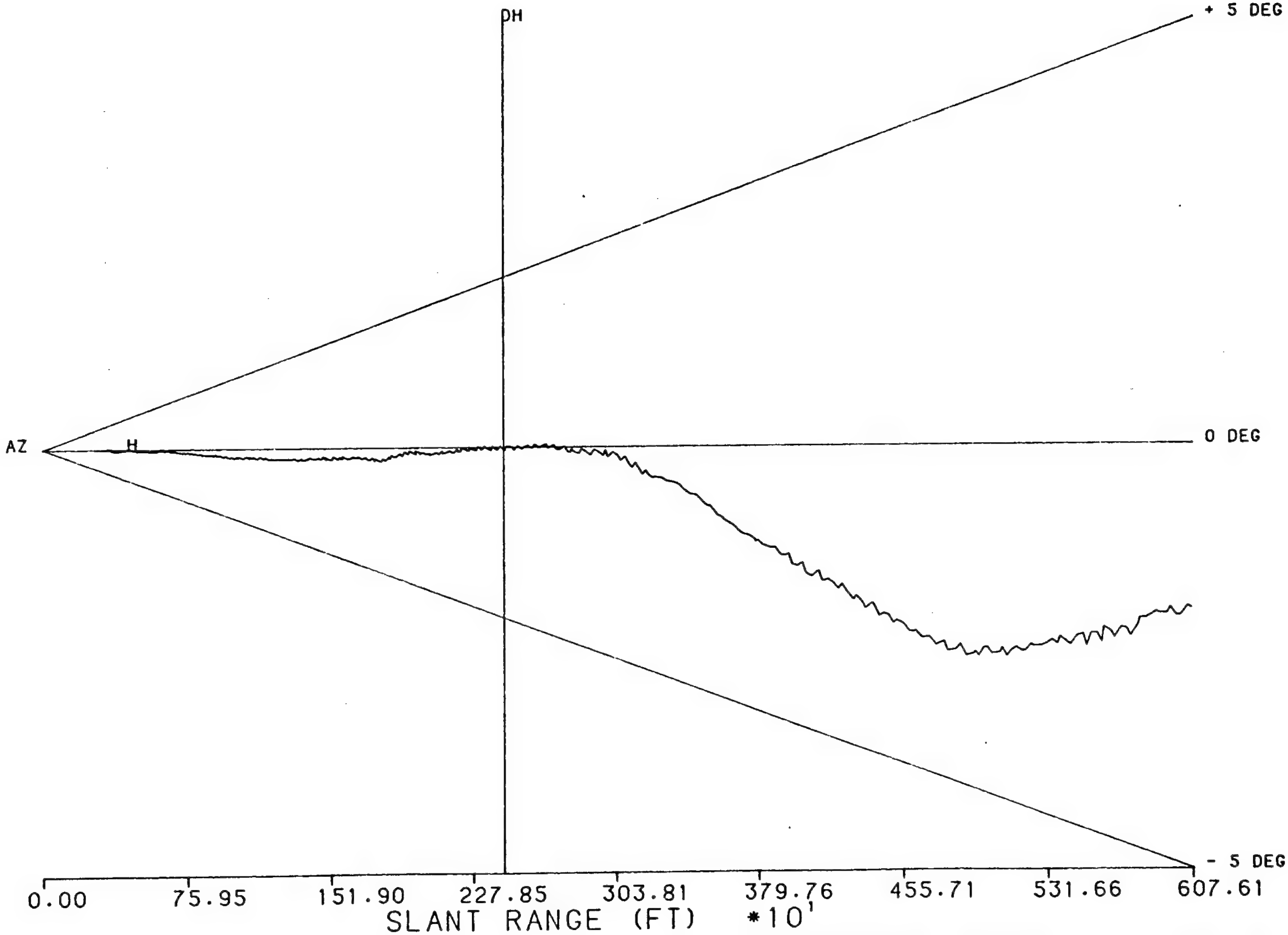

RUN # 3
4/26/88 UH1 HALS 3 DEGREE EL 200 FT DH 138 DEGREE AZ ON STE
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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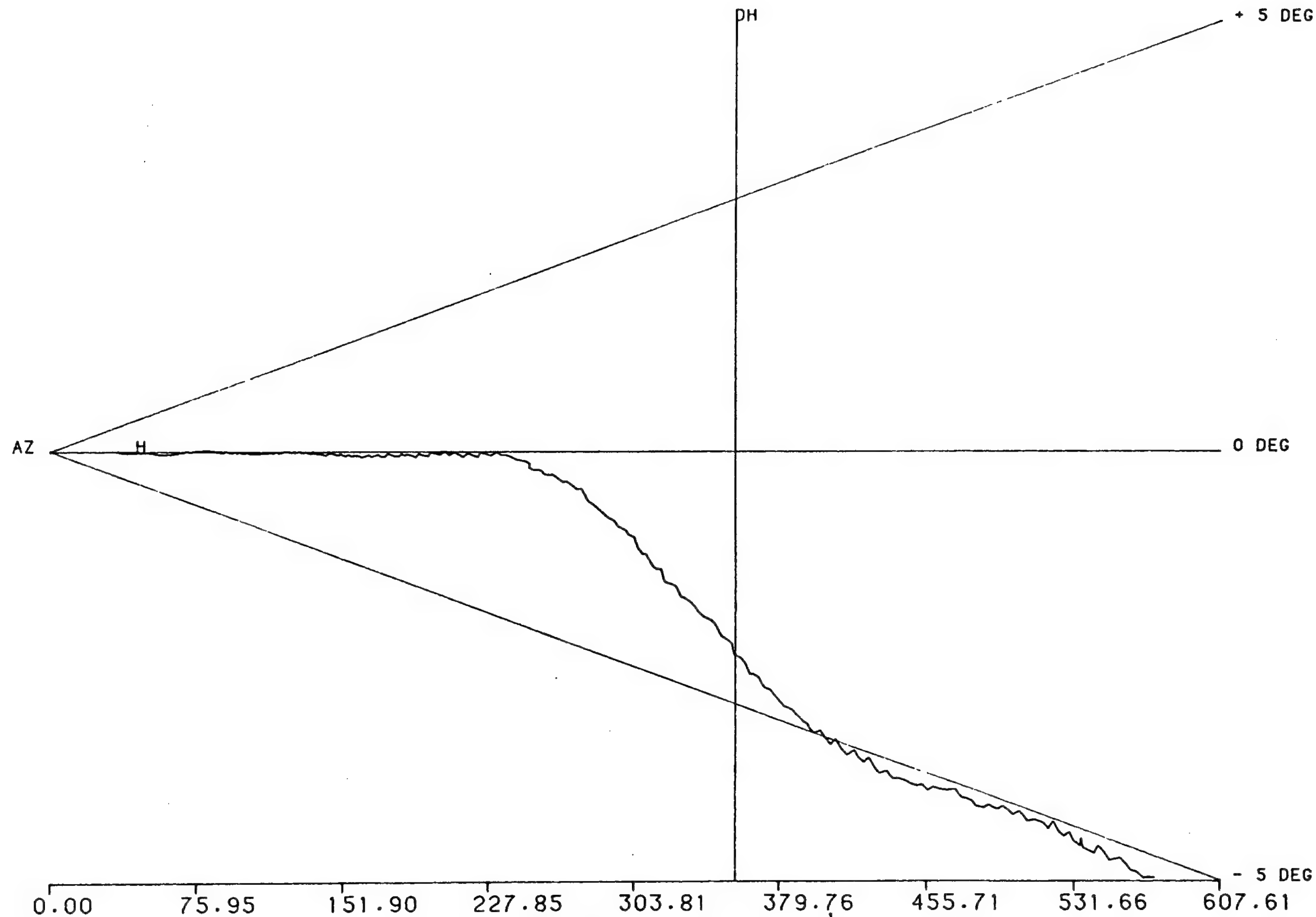
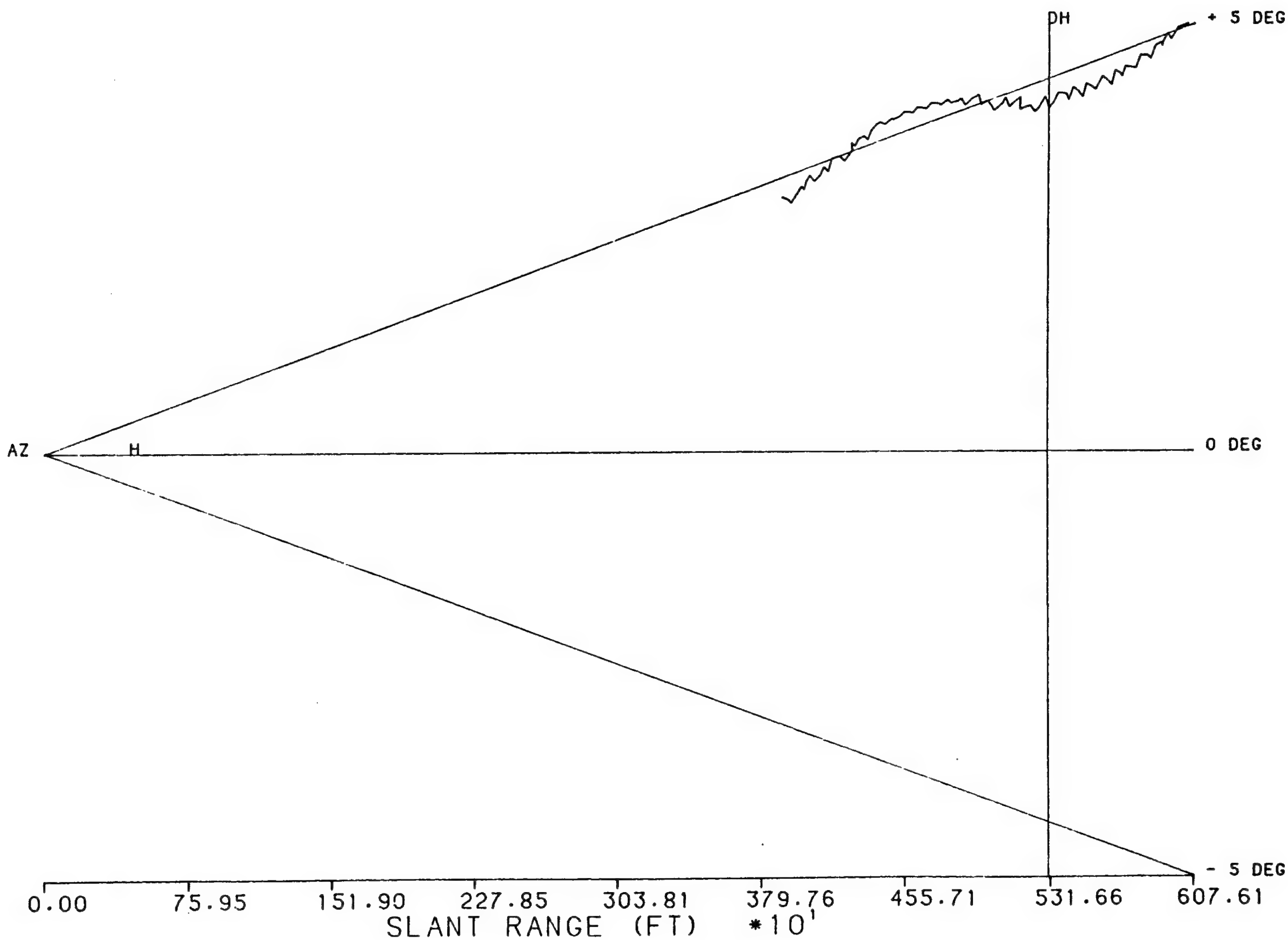


RUN # 4
4/26/88 UH1 HALS 3 DEGREE EL 200 FT DH 148 DEGREE AZ OFF S 4
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 5

4/26/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 143 DEGREE AZ ON S 5

AZIMUTH : +- 0.00

ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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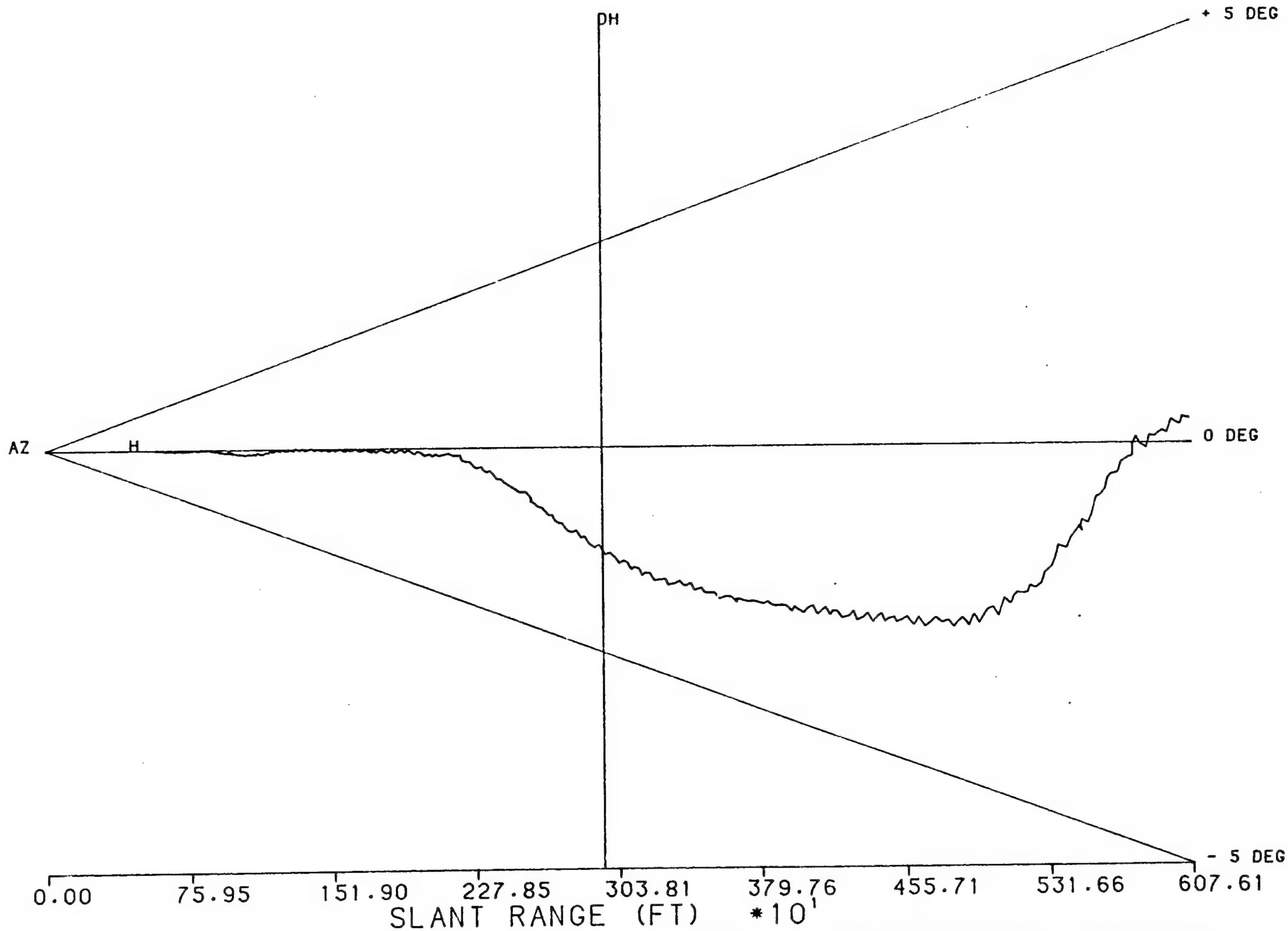

RUN # 6
4/26/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 138 DEGREE AZ OFF 6
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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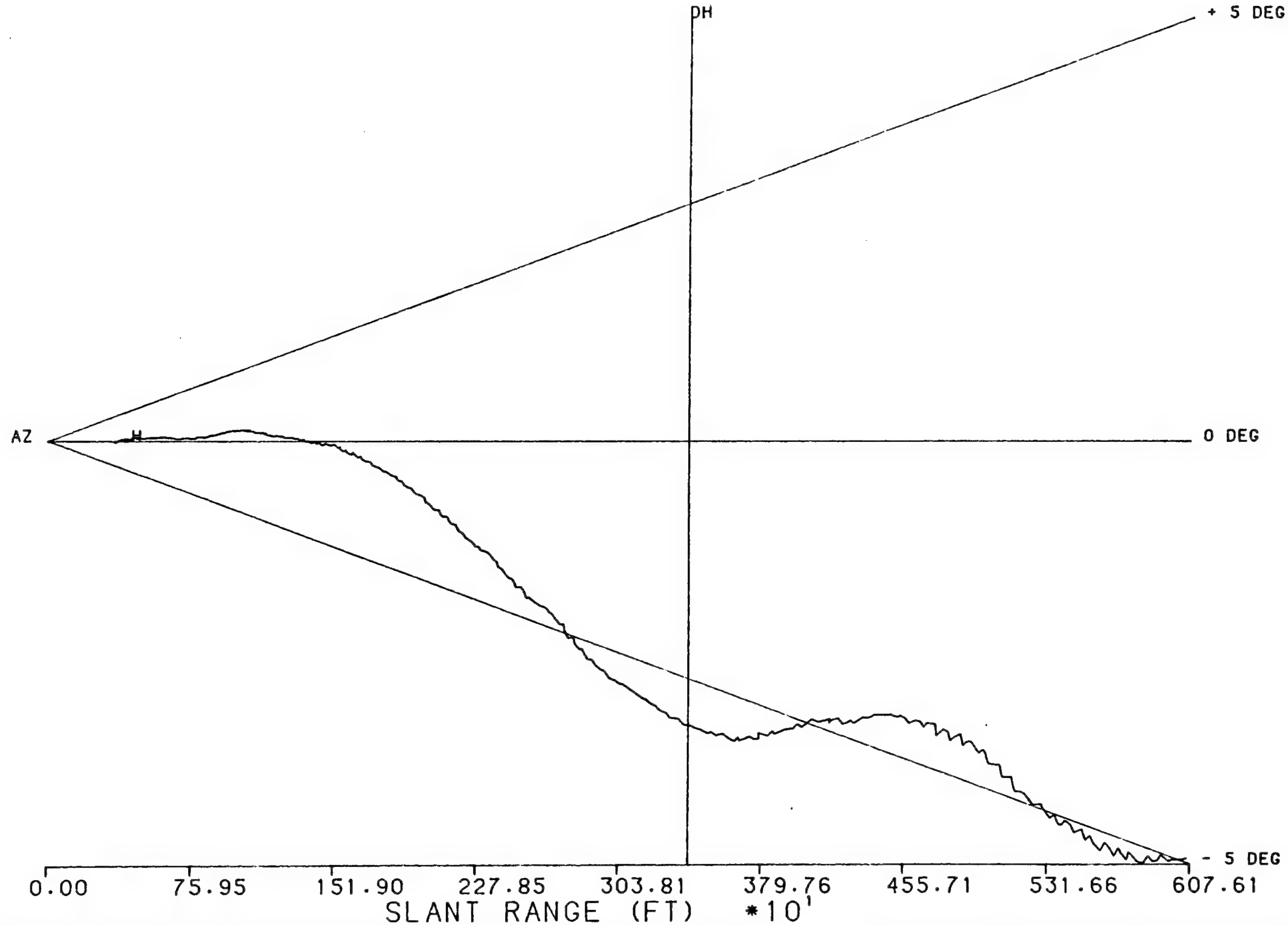

RUN # 7

4/26/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 148 DEGREE AZ OFF 7

AZIMUTH : +- 0.00

ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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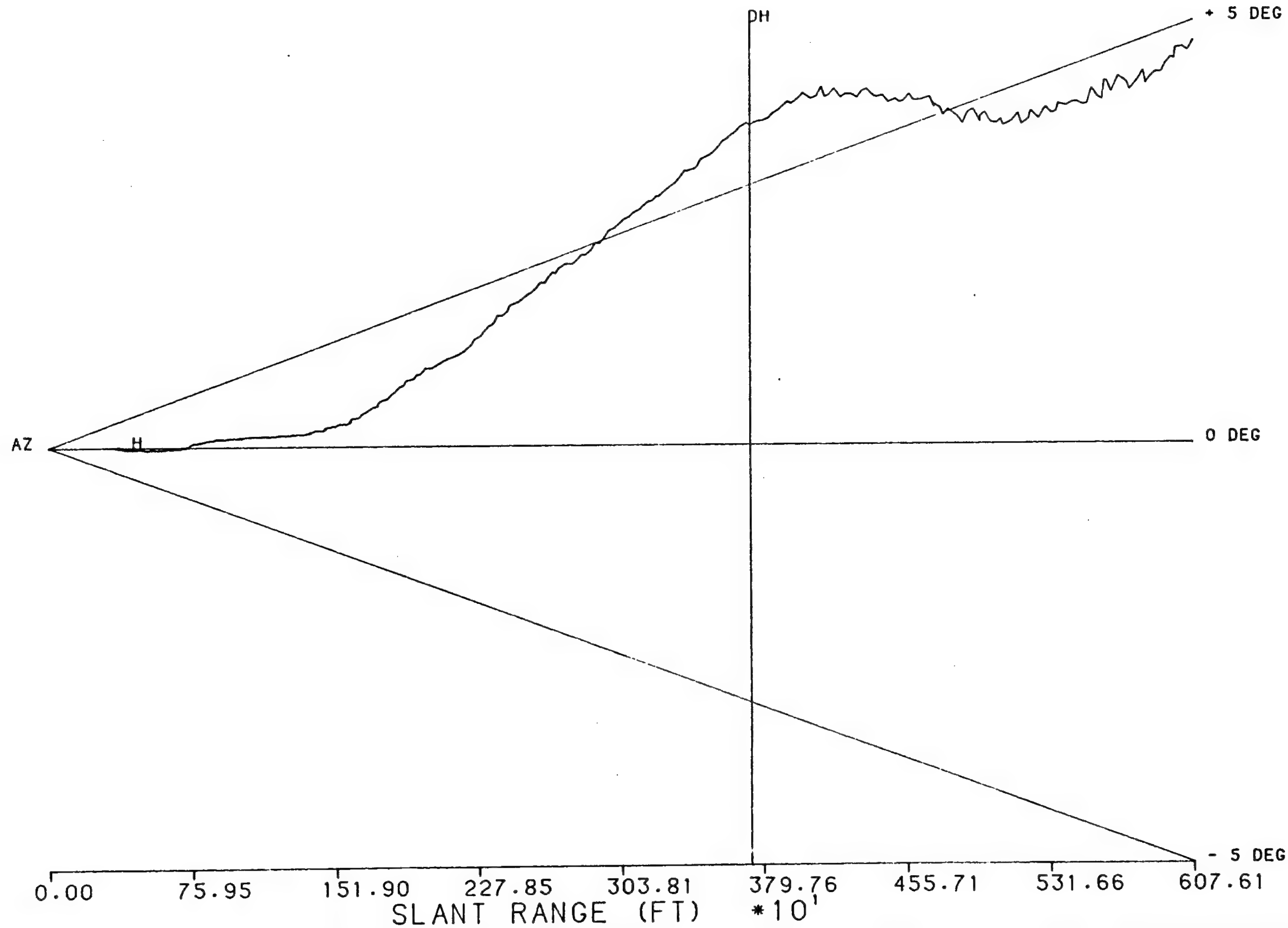
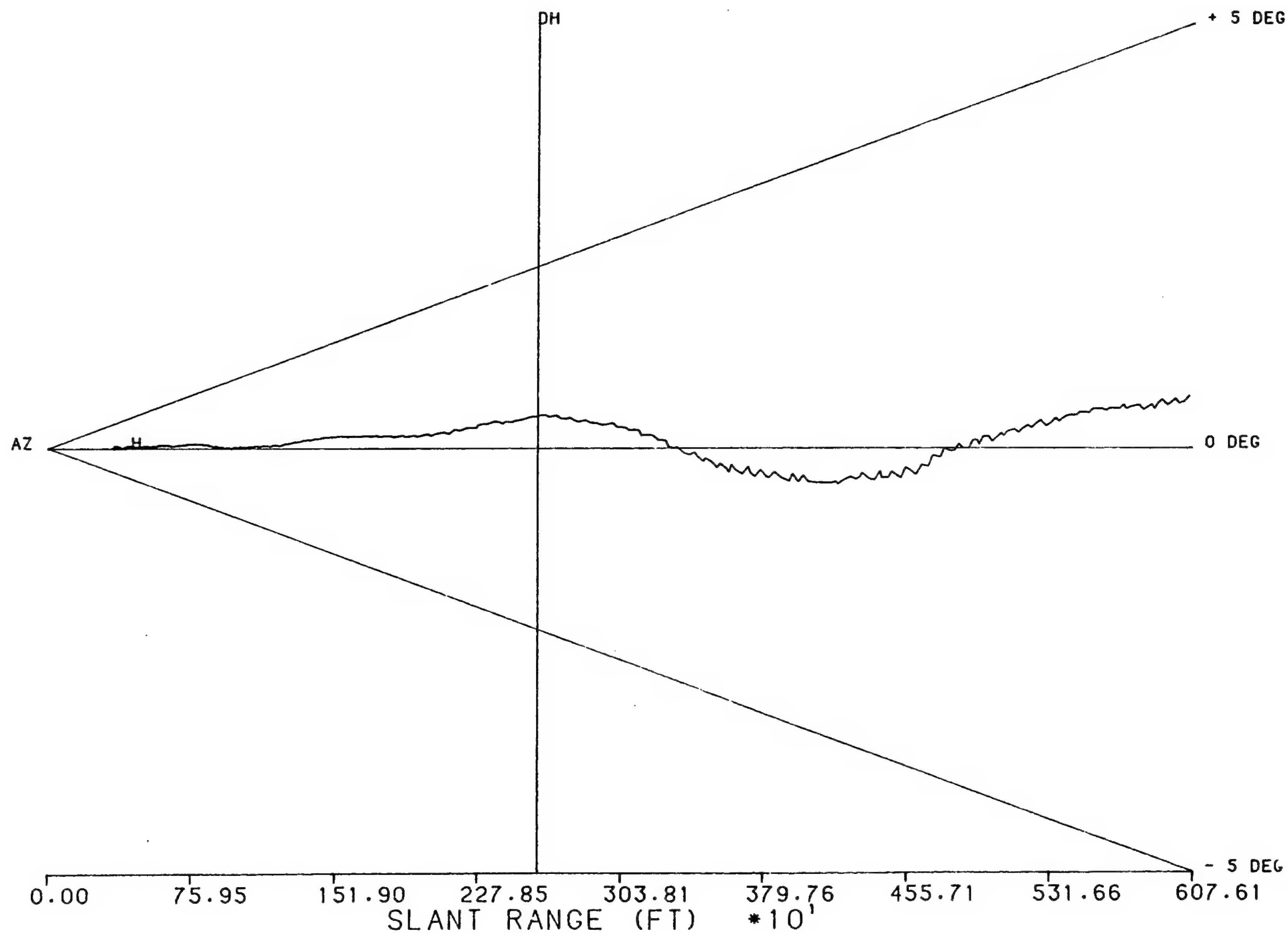


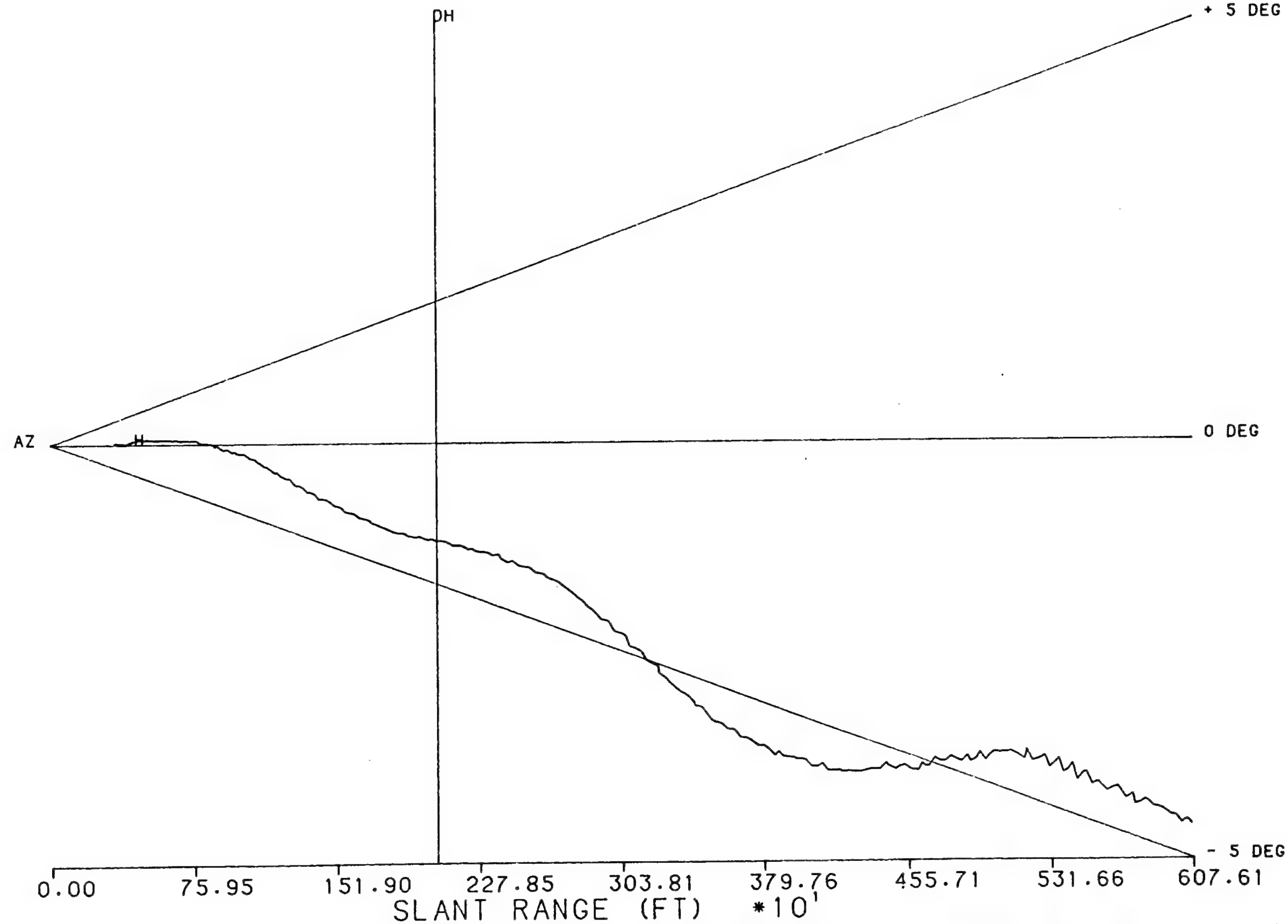
RUN # 8
4/26/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 143 DEGREE AZ ON S 8
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



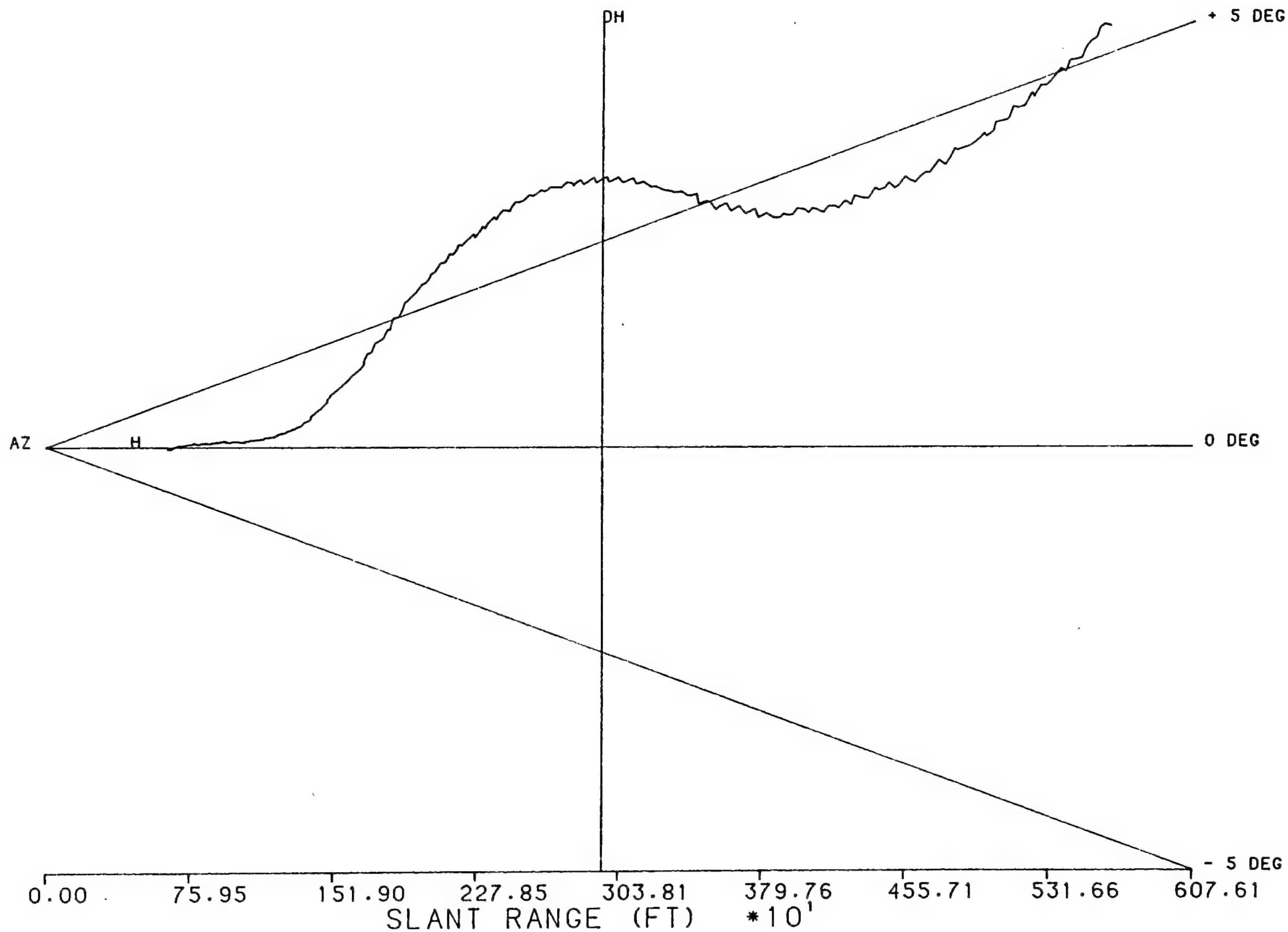
RUN # 9
4/26/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 138 DEGREE AZ ON S 9
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 10
4/26/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 148 DEGREE AZ OFF 10
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT. N J 08405



RUN # 1
4/20/88 UH1 HALS 3 DEGREE 200 FT DH CL STEP 1 LANDING
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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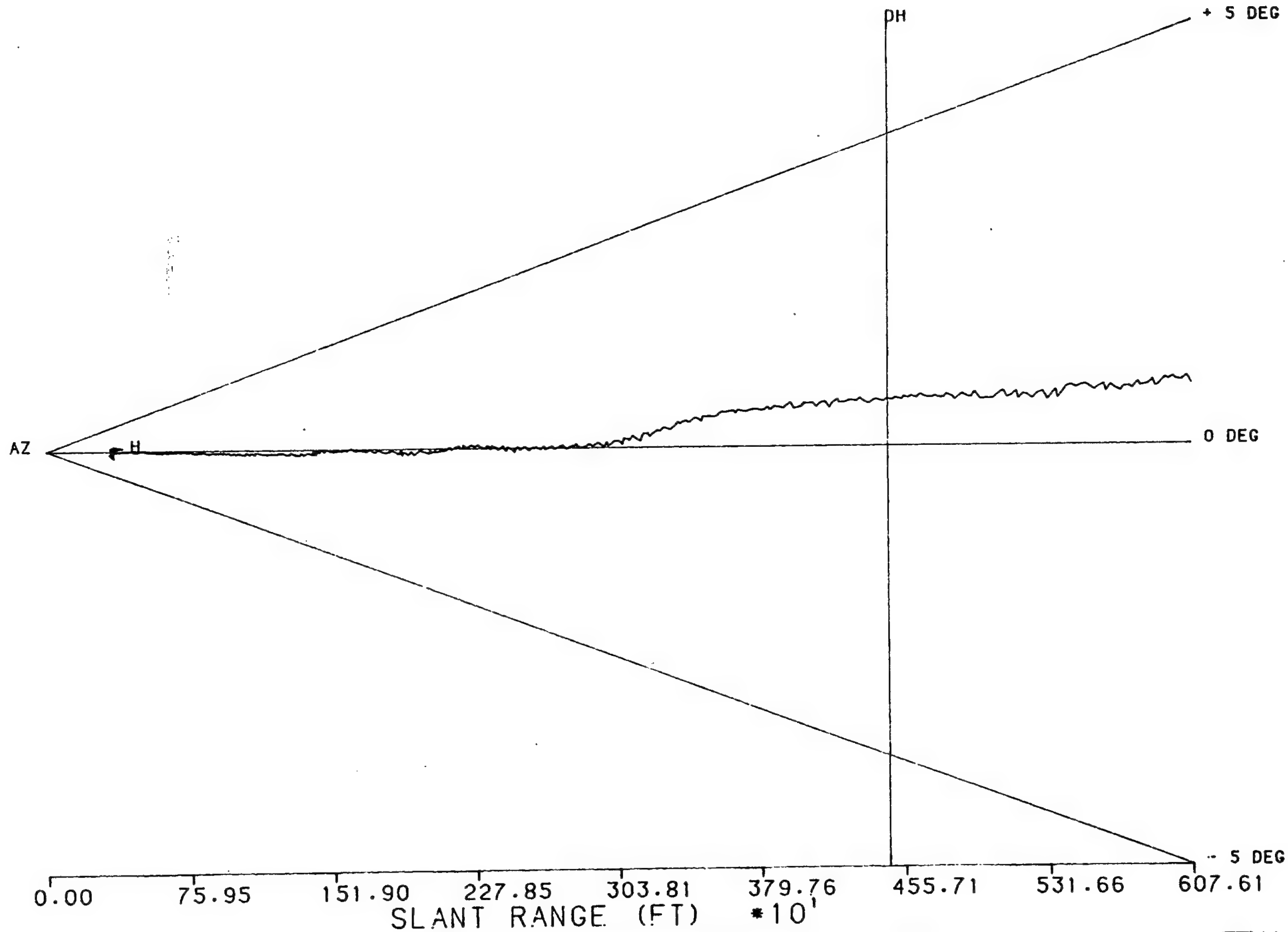
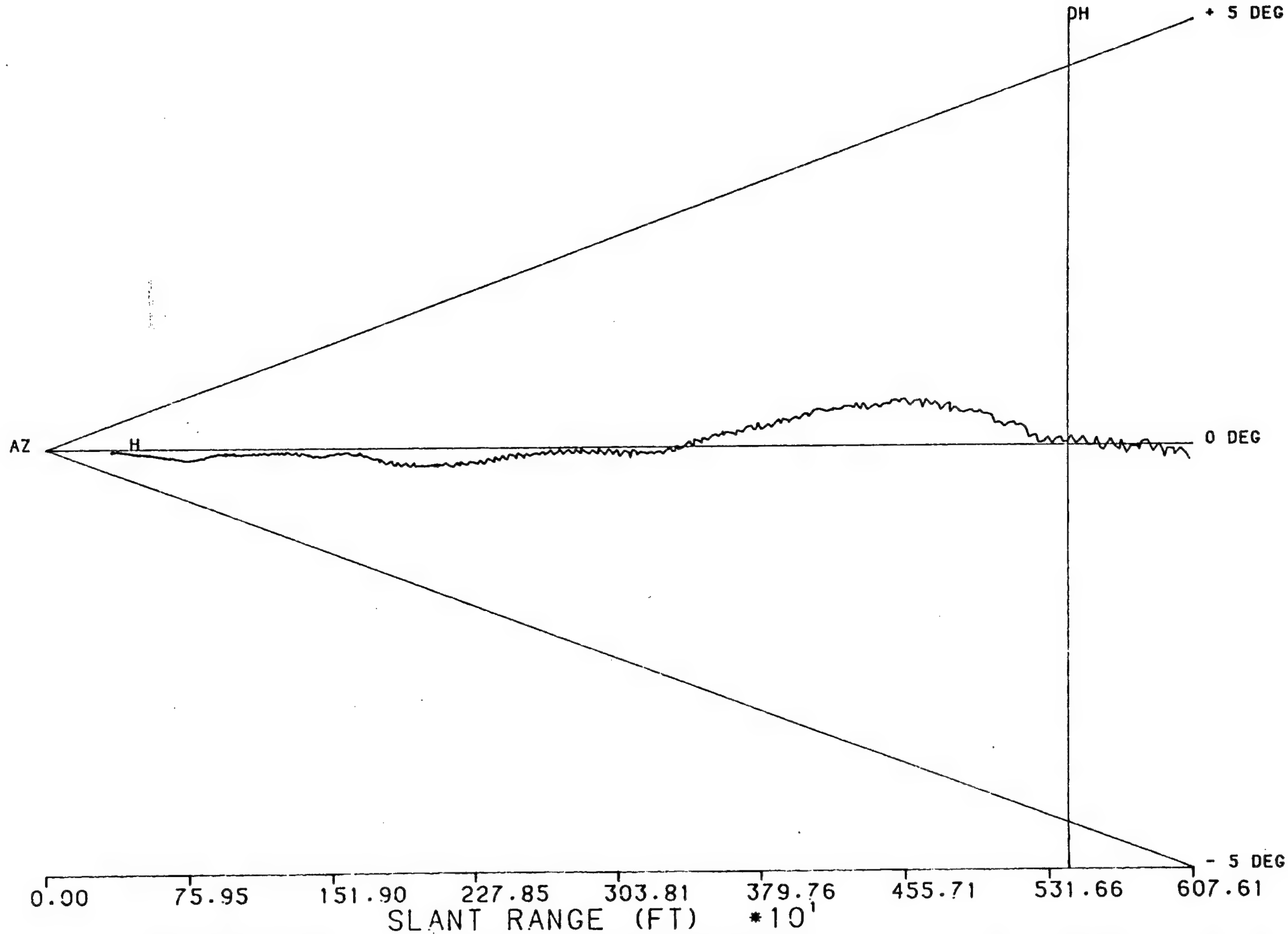


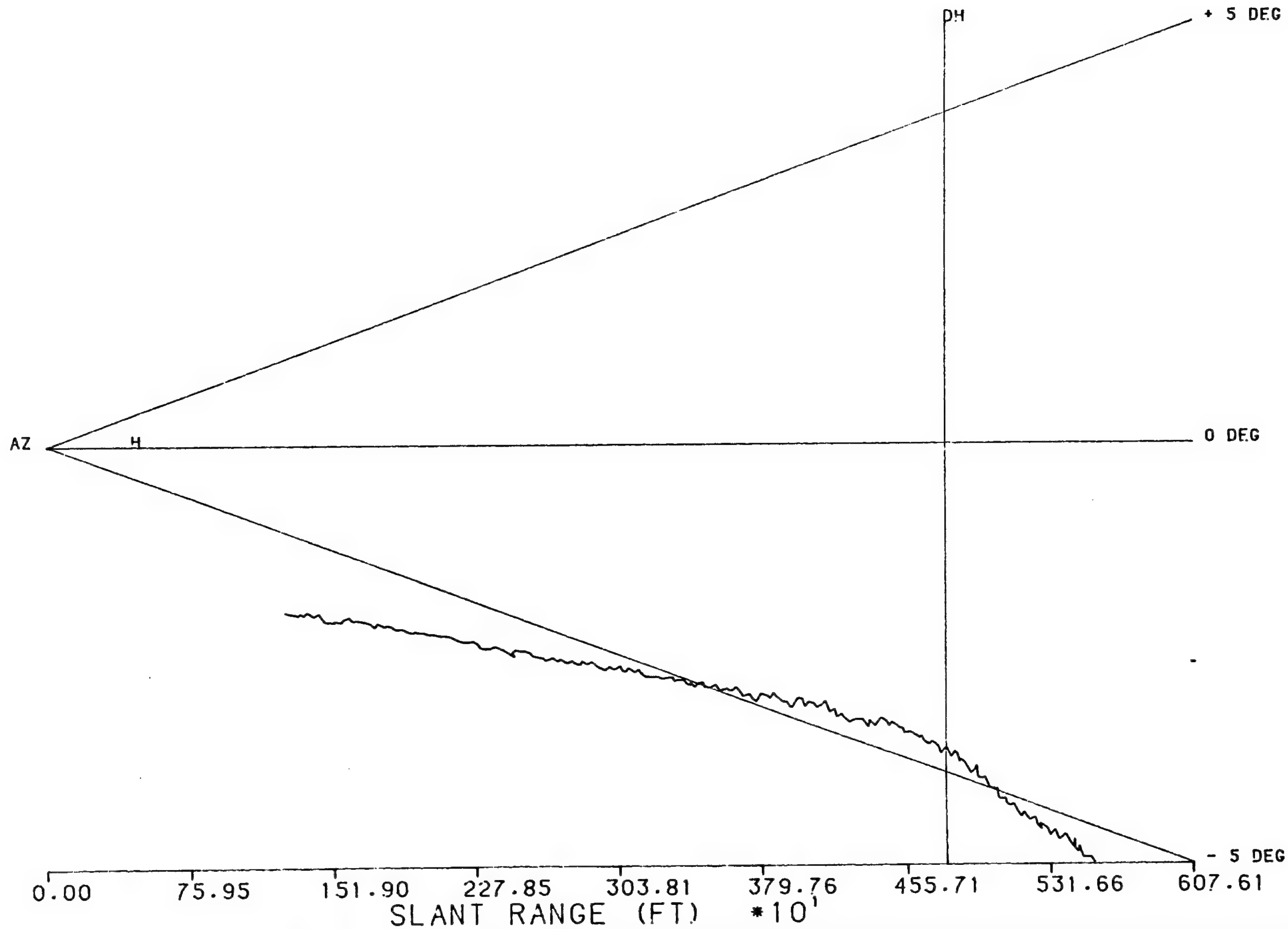
RUN # 2
4/20/88 UH1 HALS 3 DEGREE 200 FT DH CL OFF LANDING
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



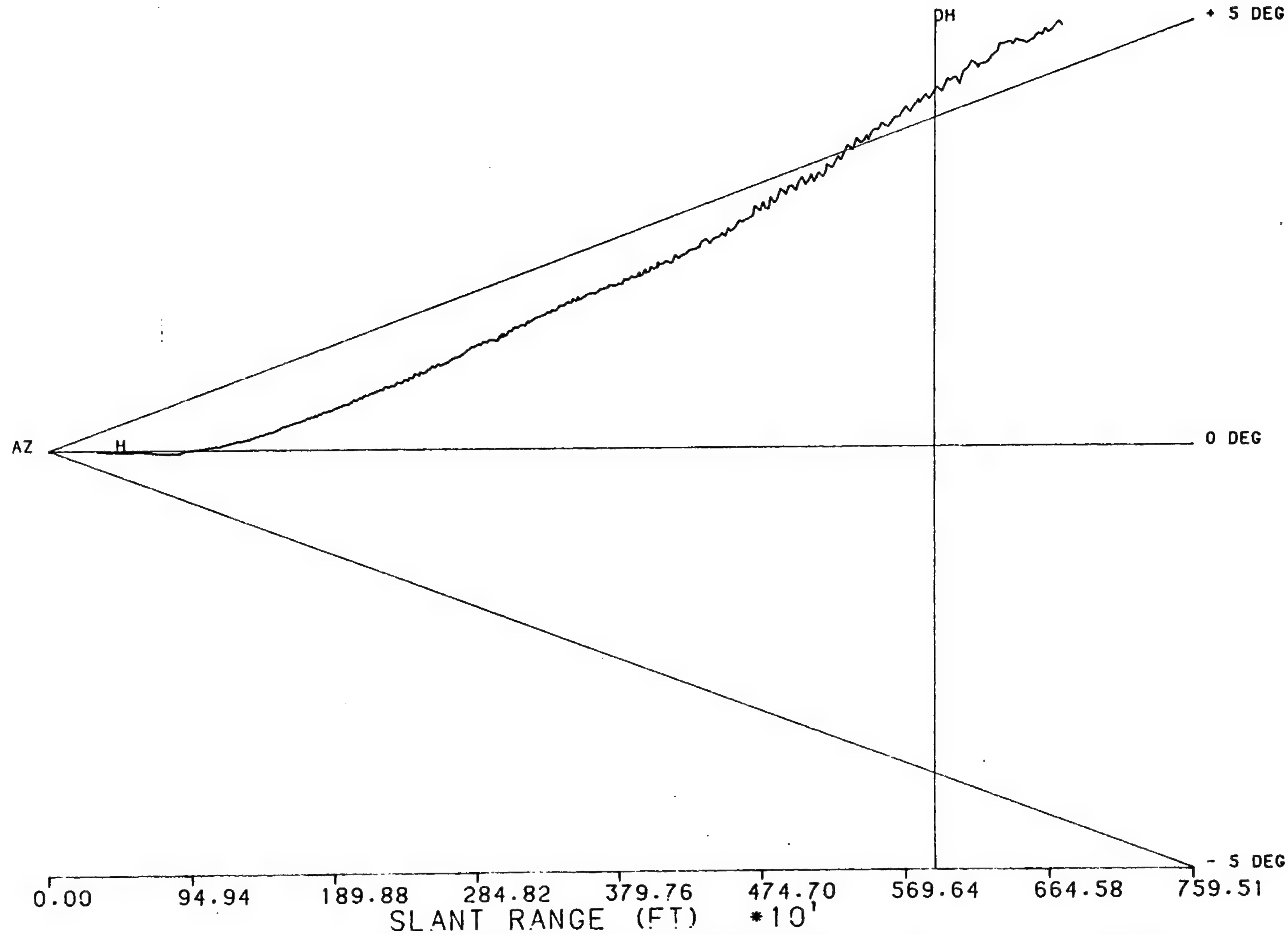
RUN # 3
4/20/88 UH1 HALS 3 DEGREE 200 FT DH 5 DEG R STEP 3 MA
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



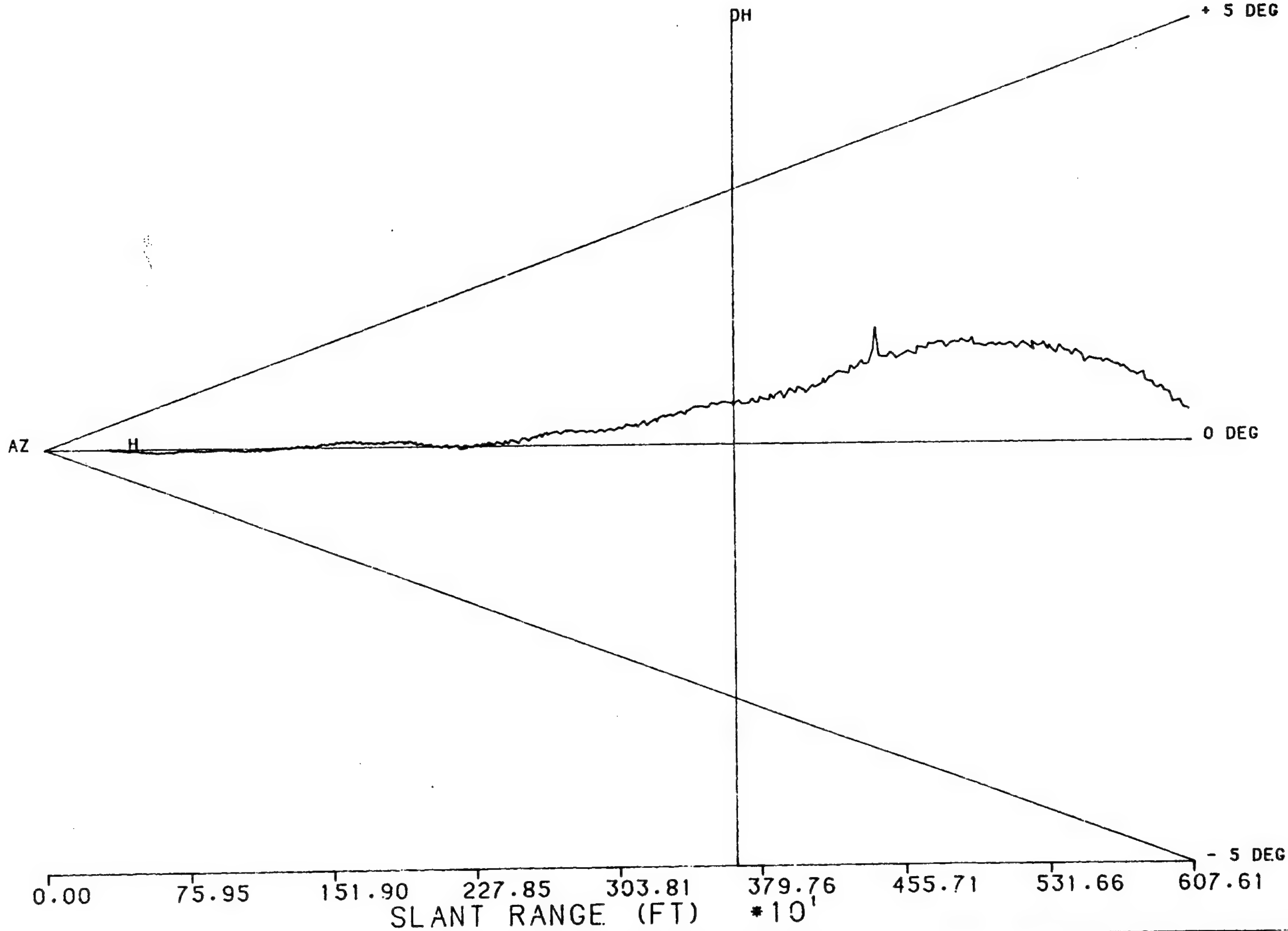
RUN # 4
4/20/88 UH1 HALS 3 DEGREE 200 FT DH 5 DEG L OFF LANDING
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



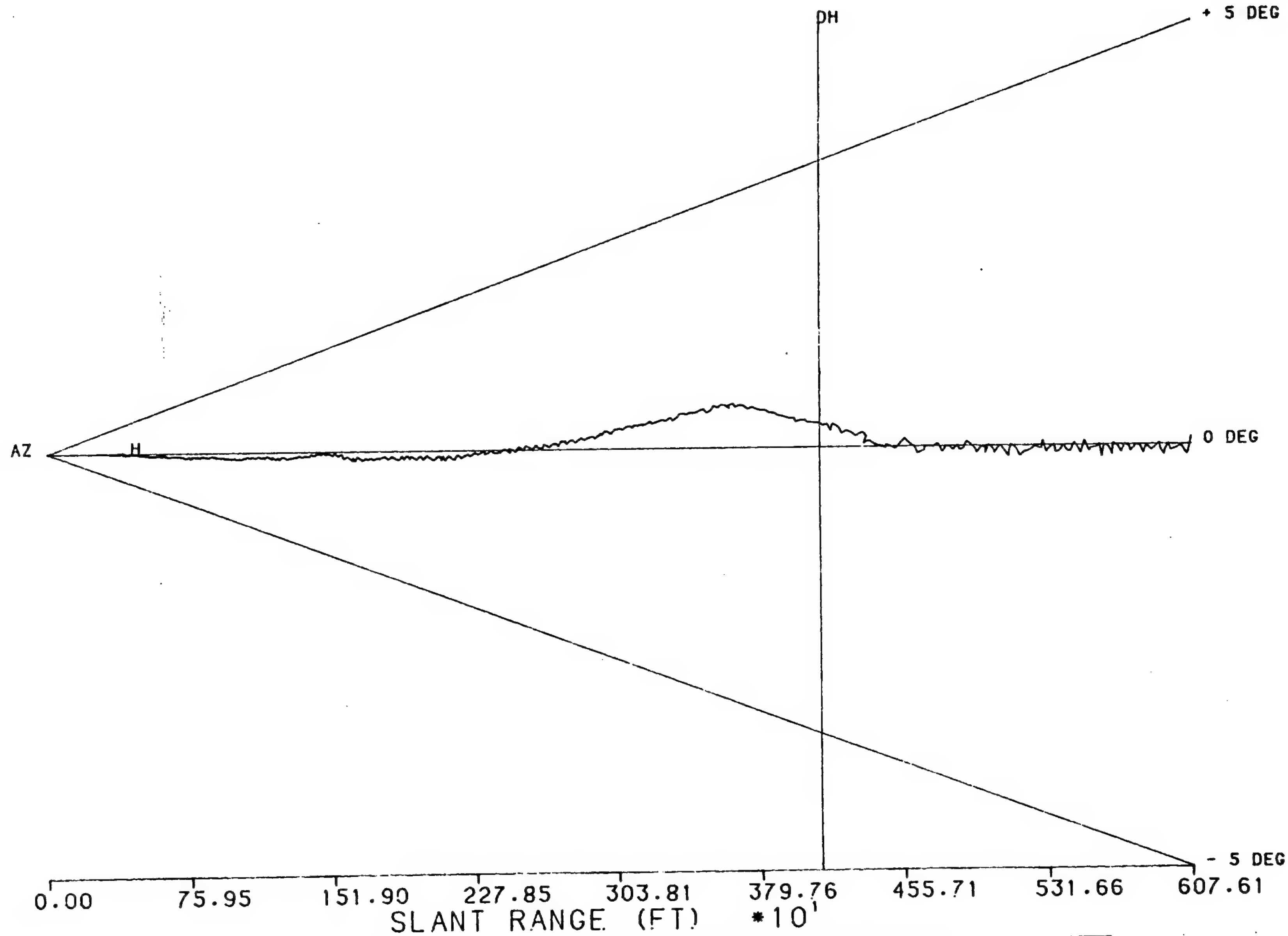
RUN # 5
4/20/88 UH1 HALS 4.5 DEGREE 250 FT DH CL STEP 3 LANDING
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



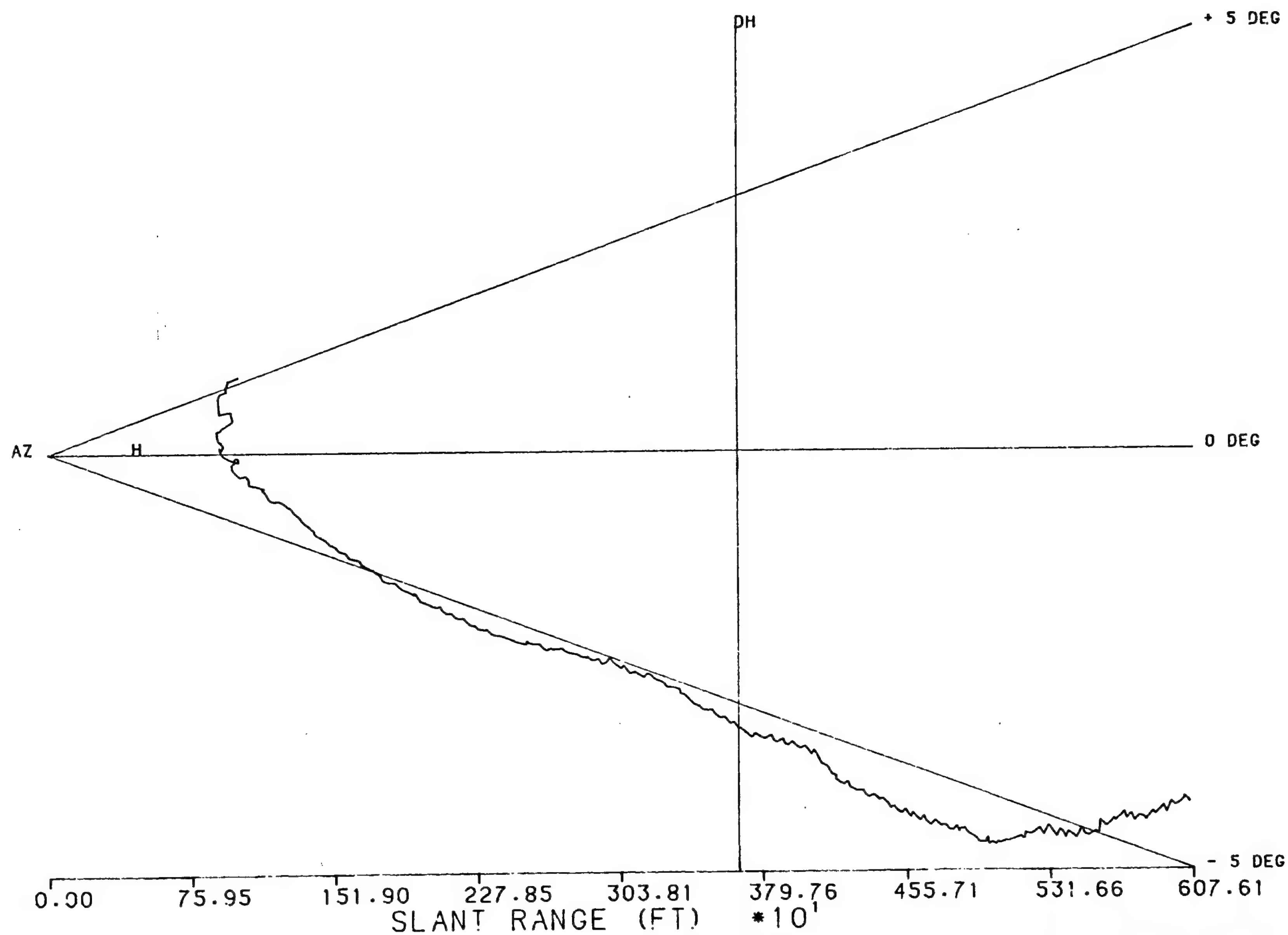
RUN # 6
4/20/88 UH1 HALS 4.5 DEGREE 250 FT DH CL OFF LANDING
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



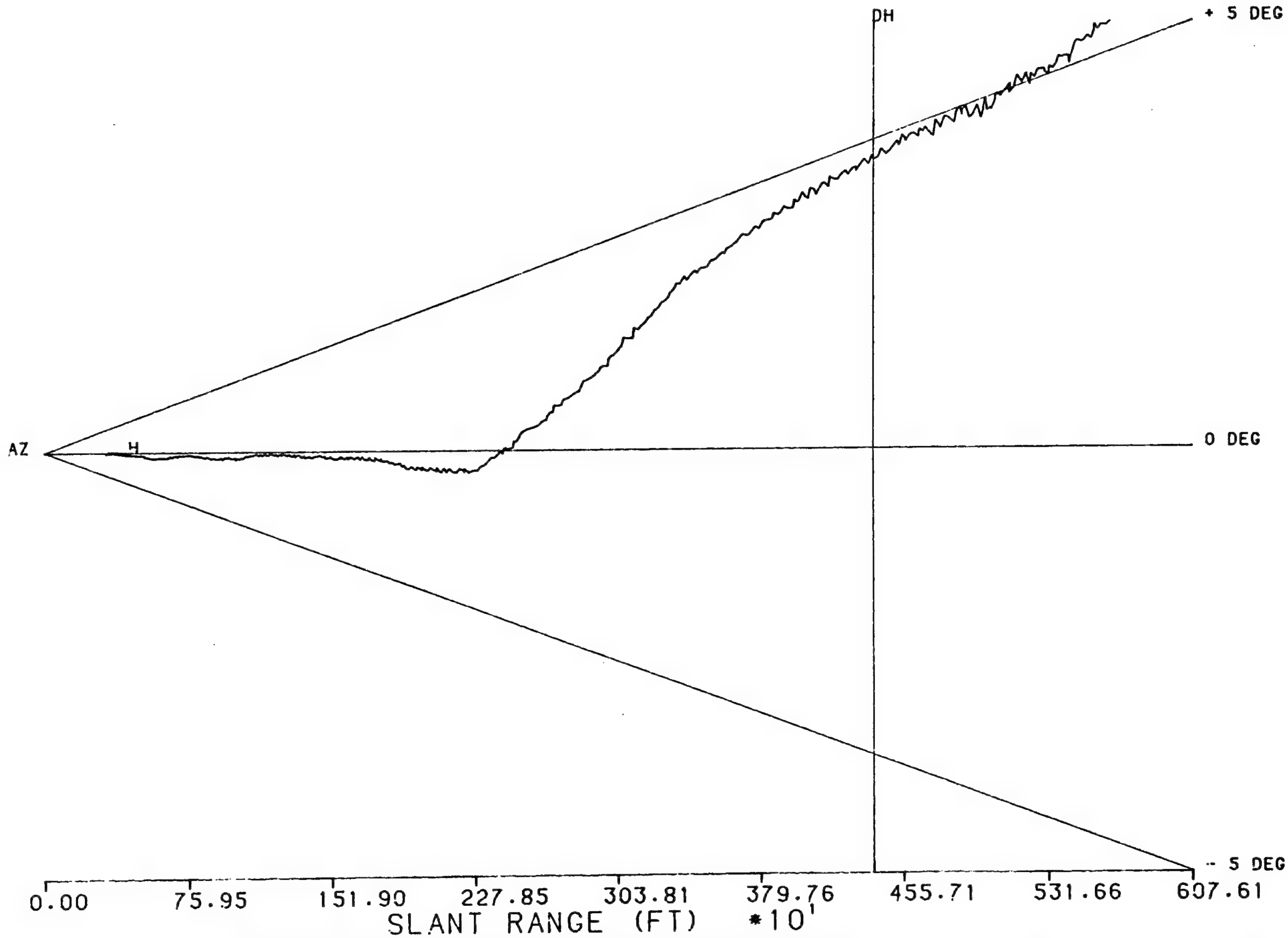
RUN # 7
4/20/88 UH1 HALS 4.5 DEGREE 250 FT DH 5 DEG RT STEP 1 MA
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



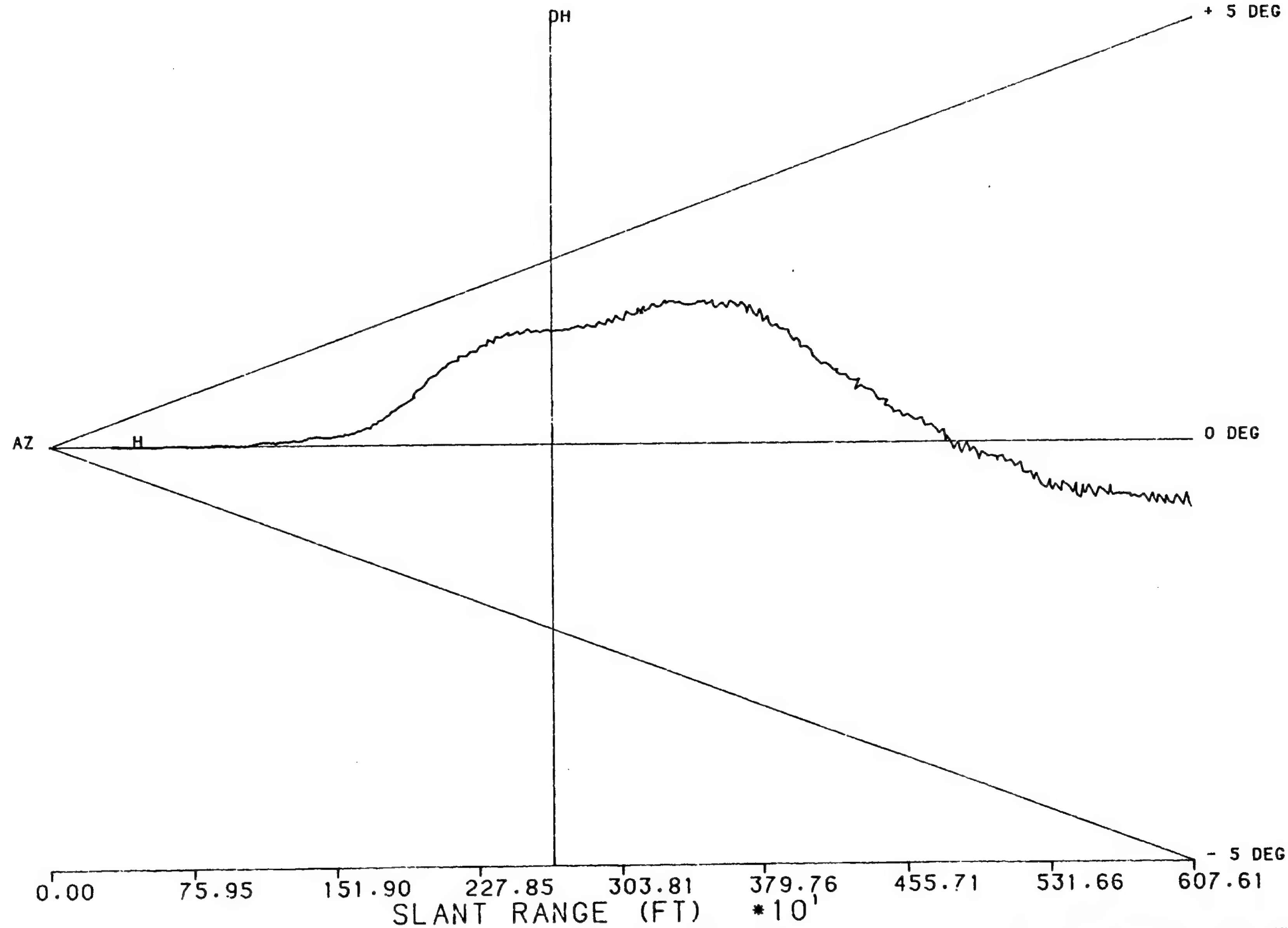
RUN # 8
4/20/88 UH1 HALS 4.5 DEGREE 250 FT DH 5 DEG L STEP 1 LANDING
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



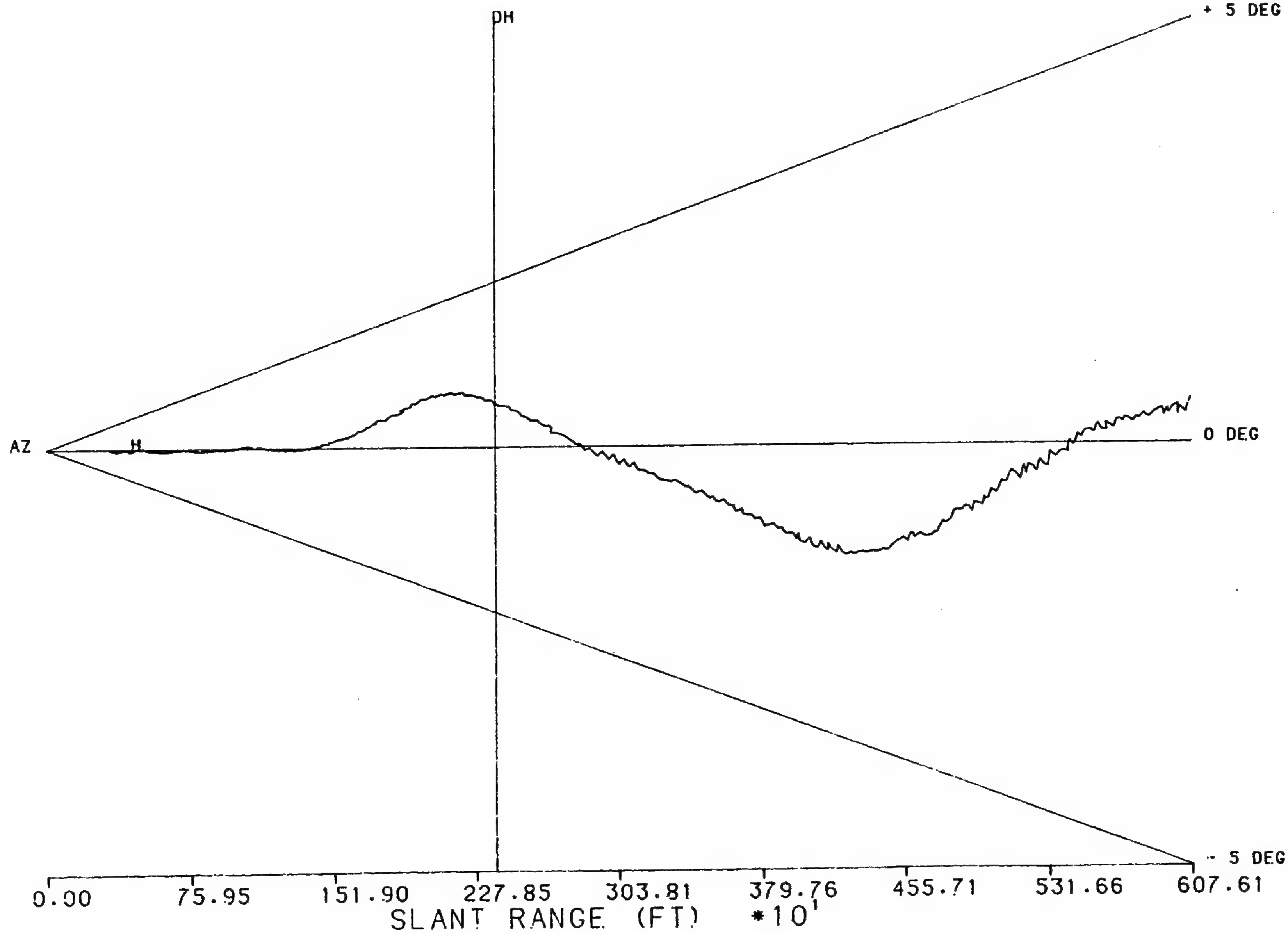
RUN # 9
4/20/88 UH1 HALS 6.0 DEGREE 250 FT DH CL STEP 1 LANDING
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 10
4/20/88 UH1 HALS 6.0 DEGREE 250 FT DH CL OFF LANDING
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



APPENDIX E

SUBJECT PILOT RANGE RATE/VERTICAL POSITION PLOTS

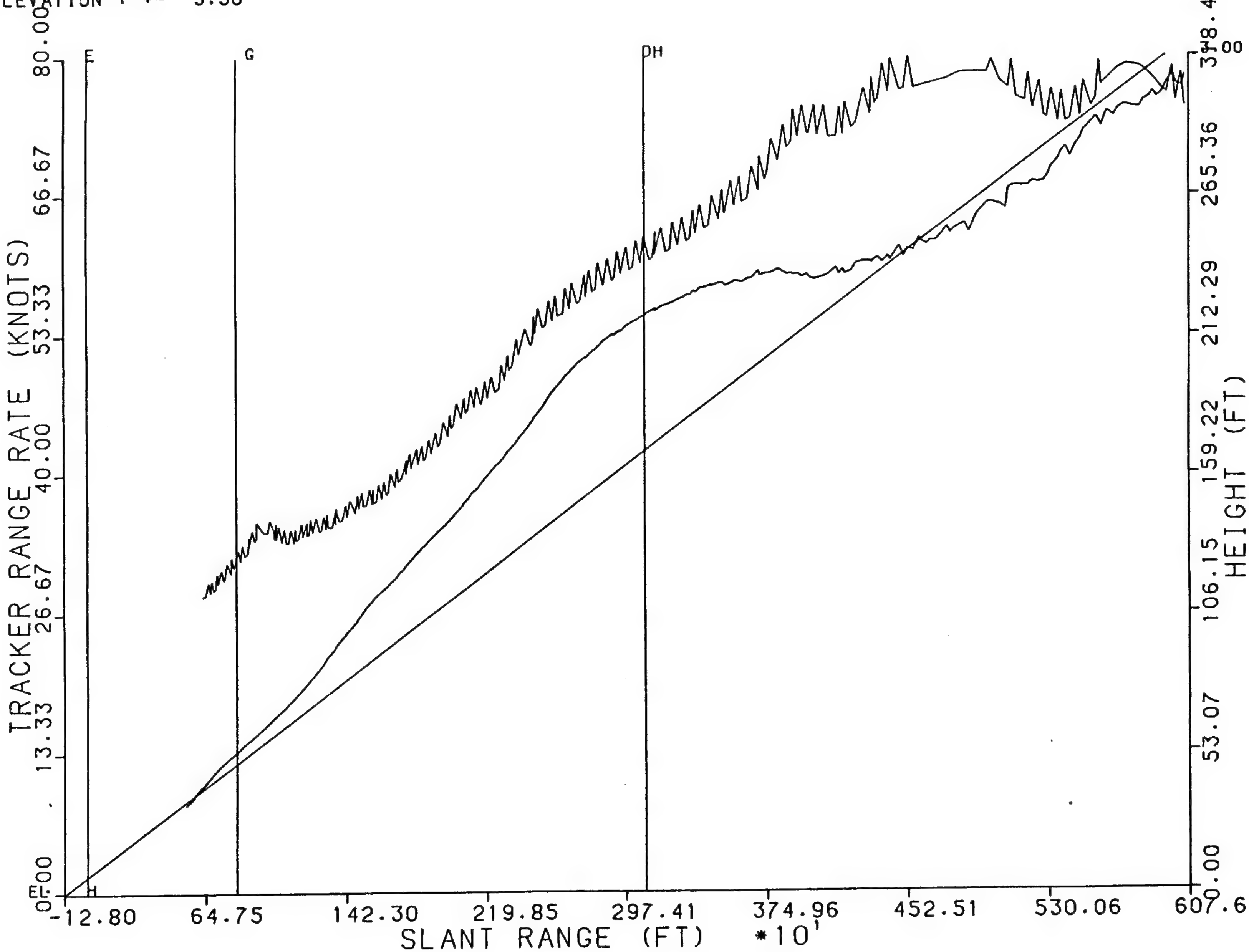
RUN # 1

4/28/88 UH1 HALS 3 DEGREE EL 200 FT DH 143 DEGREE AZ ON

AZIMUTH : +- 0.00

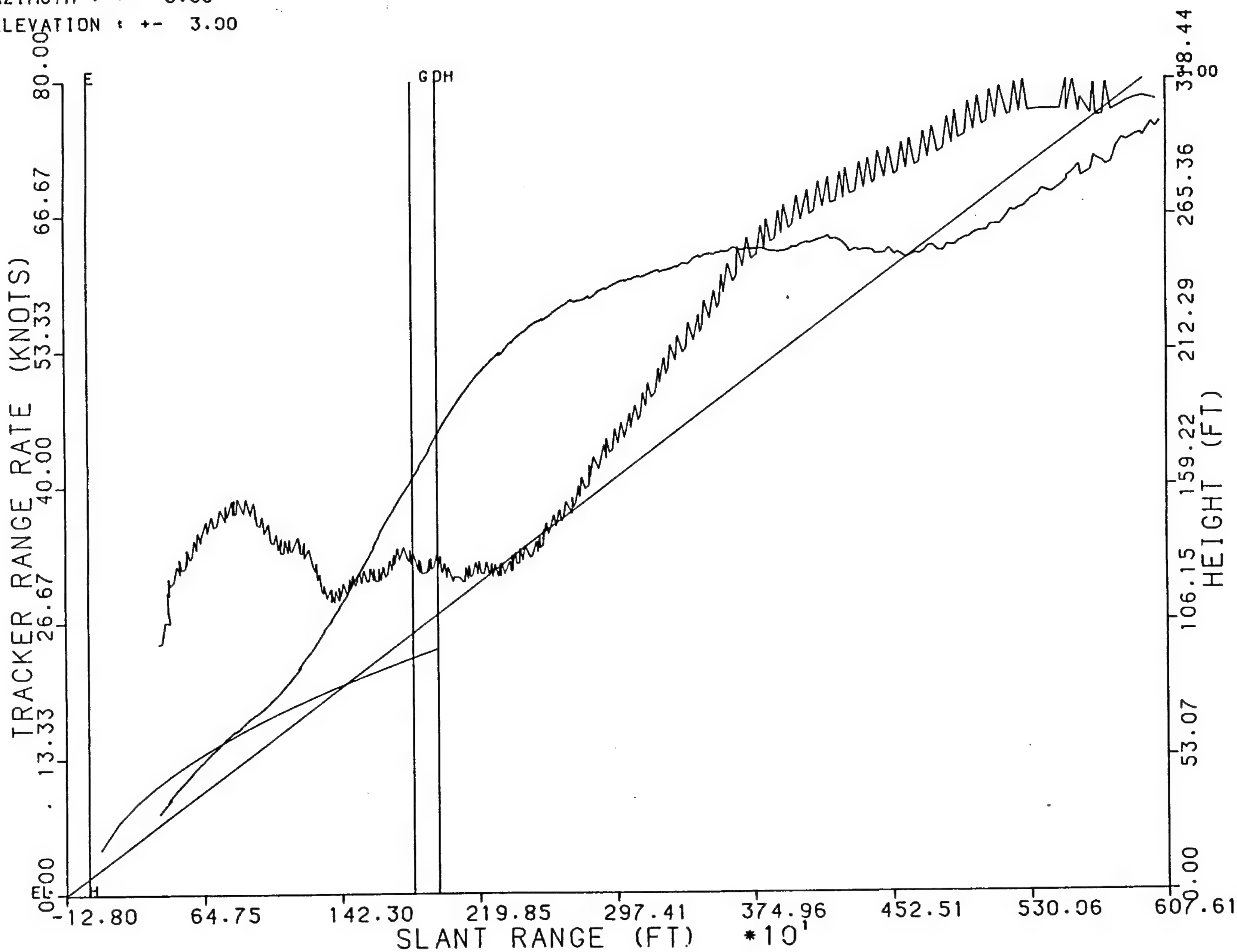
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



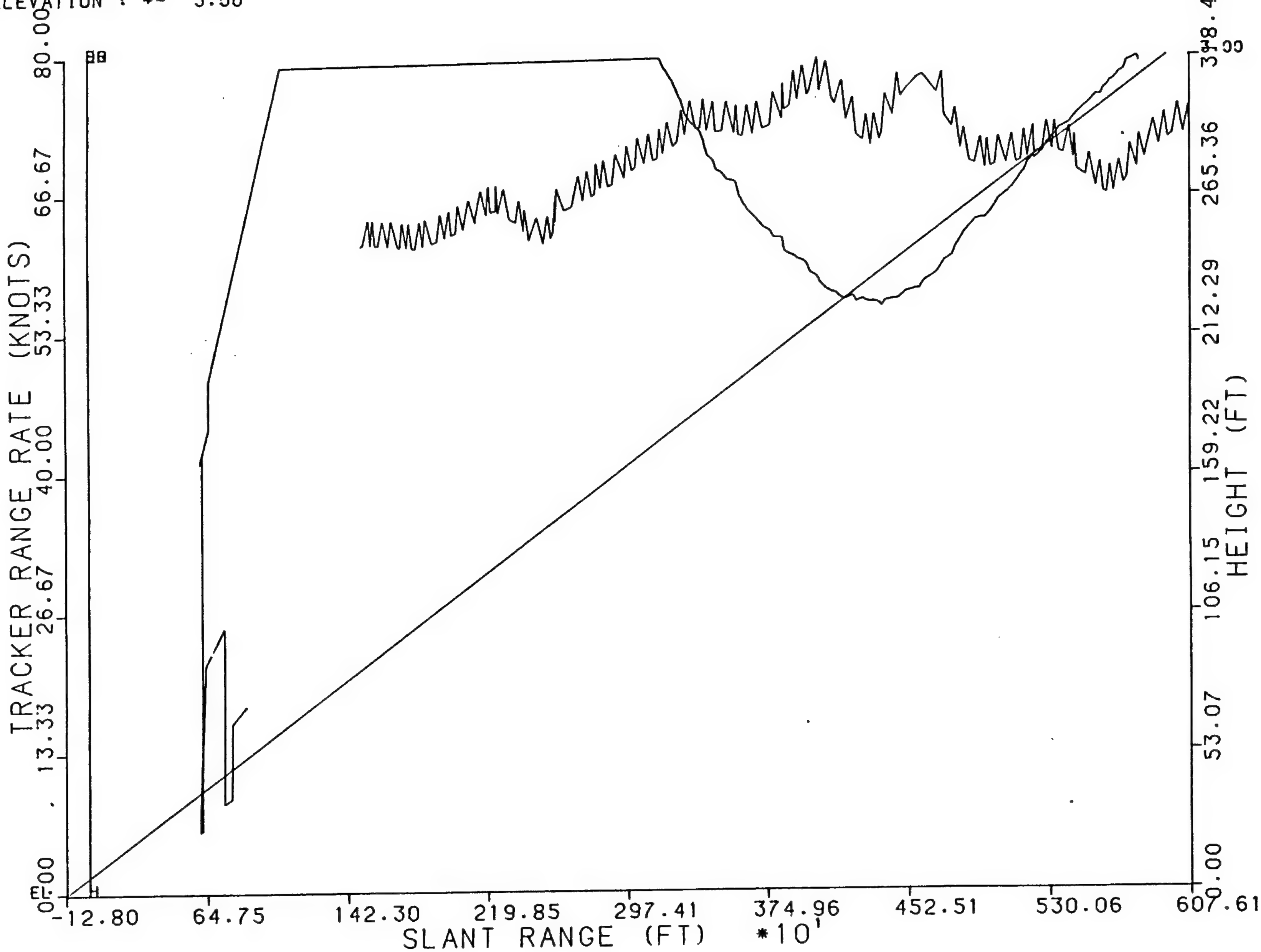
RUN # 2
4/28/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 143 DEGREE AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



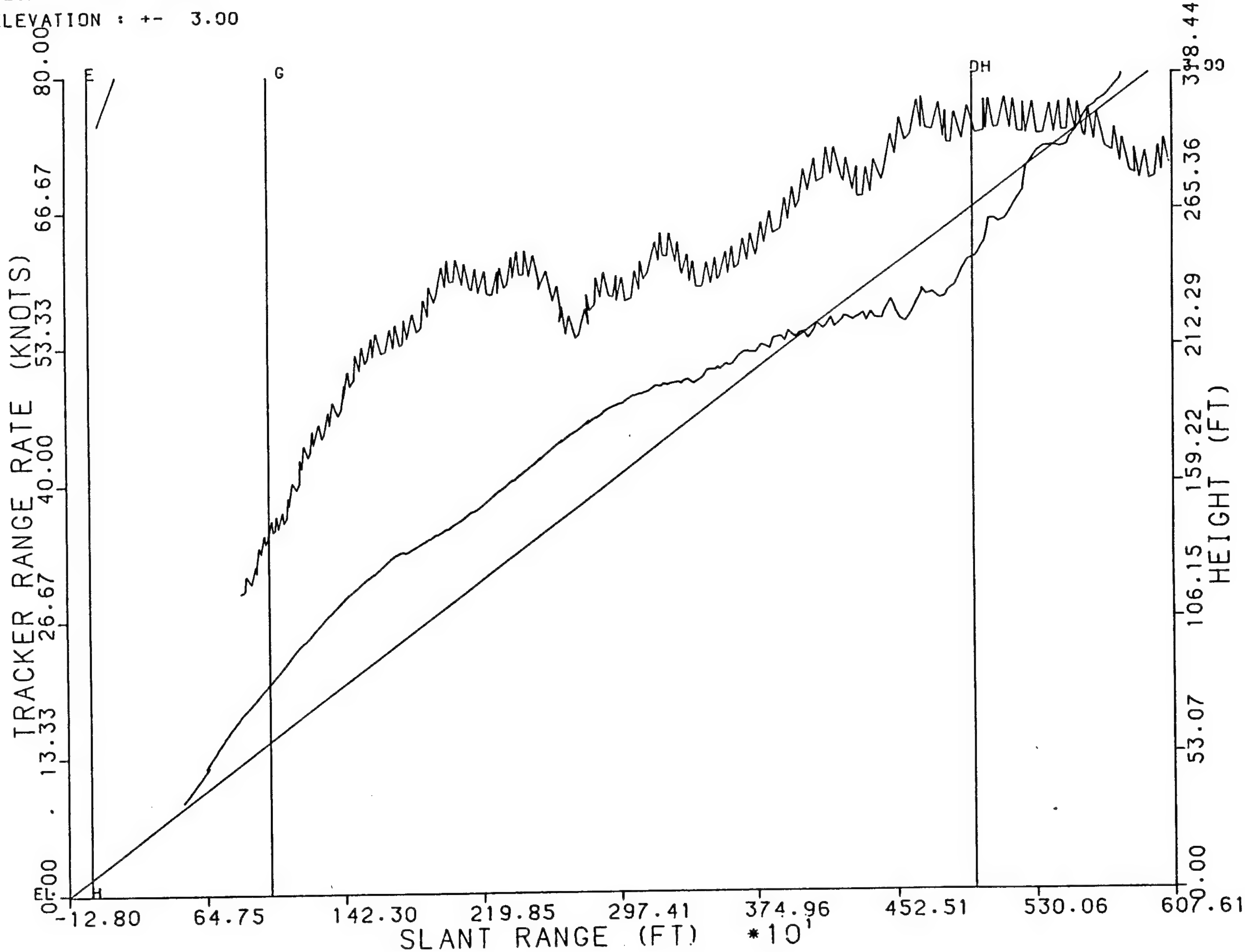
RUN # 3
4/28/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 138 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 4
4/28/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 148 DEGREE AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



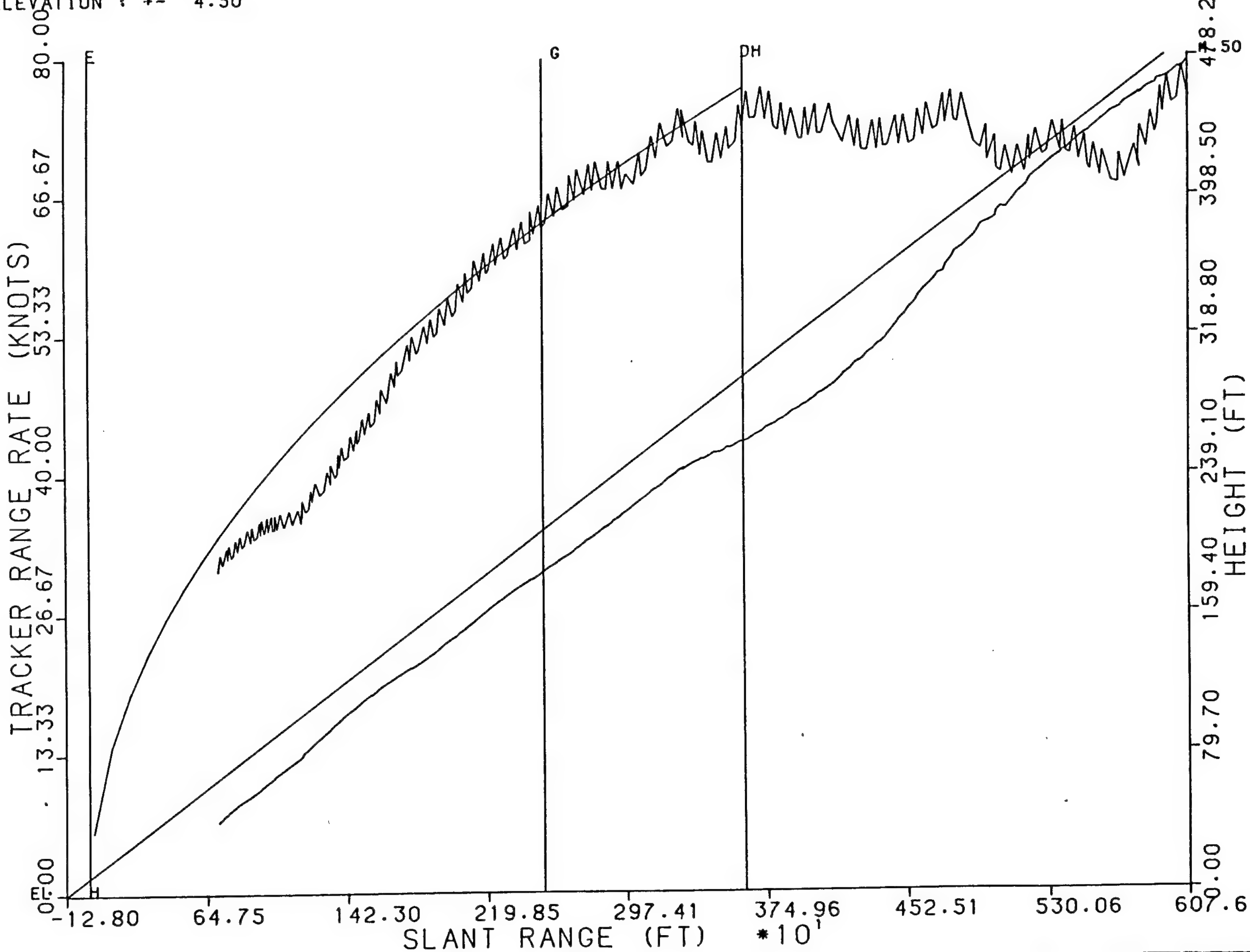
RUN # 5

4/28/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 143 DEGREE AZ ON

AZIMUTH : +- 0.00

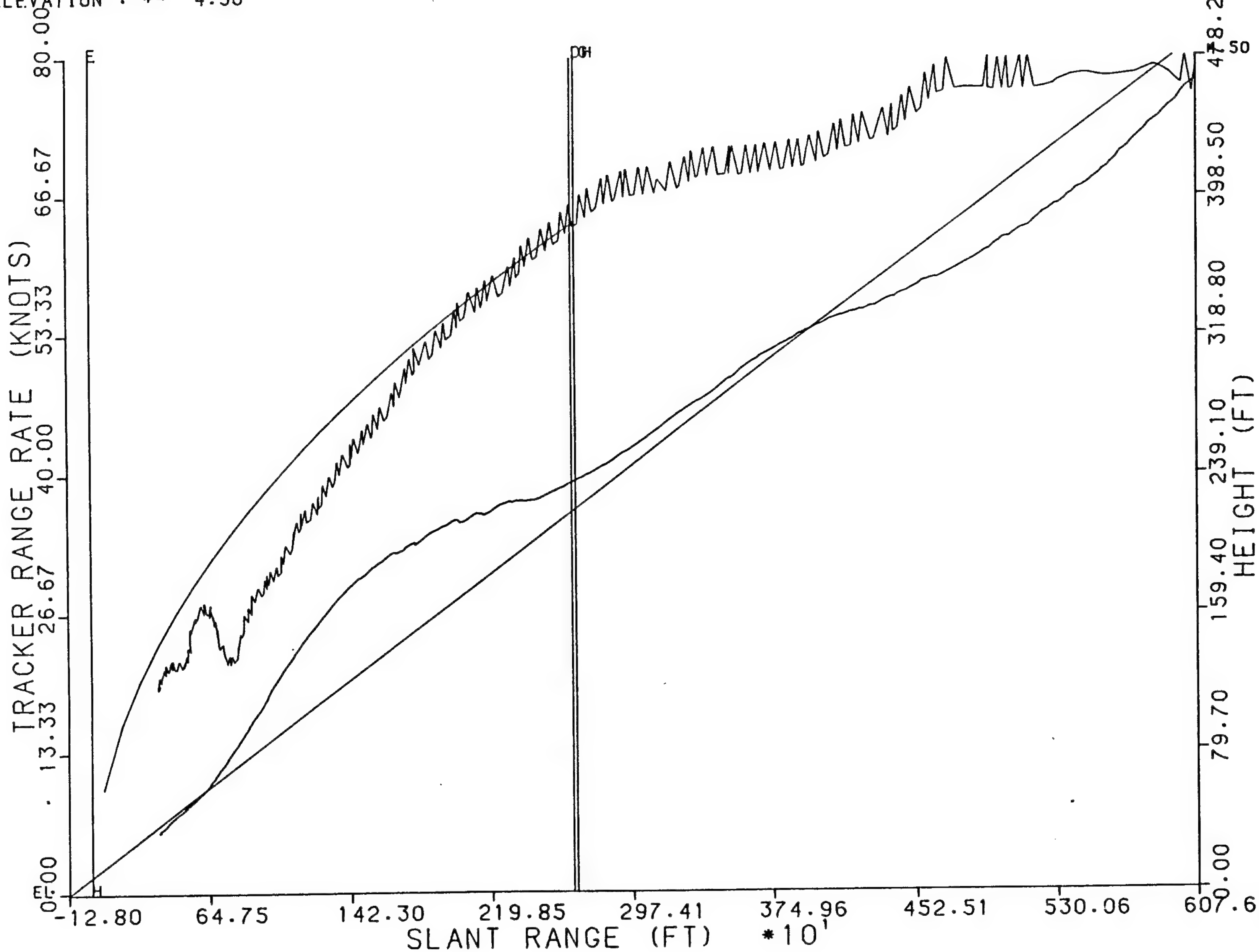
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT. N J 08405



RUN # 6
4/28/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 138 DEGREE AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT. N J 08405



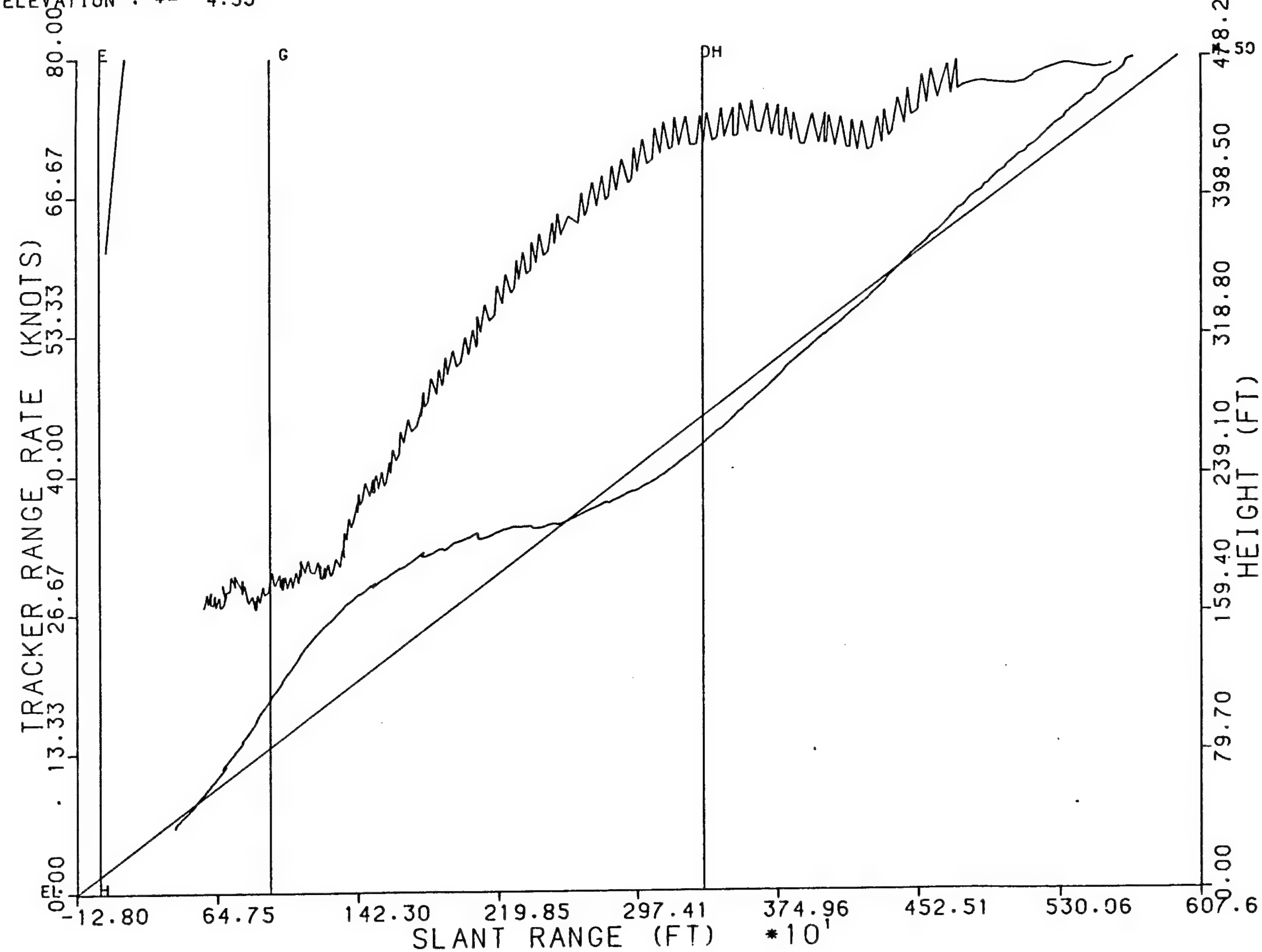
RUN # 7

4/28/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 148 DEGREE AZ OFF

AZIMUTH : +- 0.00

ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT. N J 08405



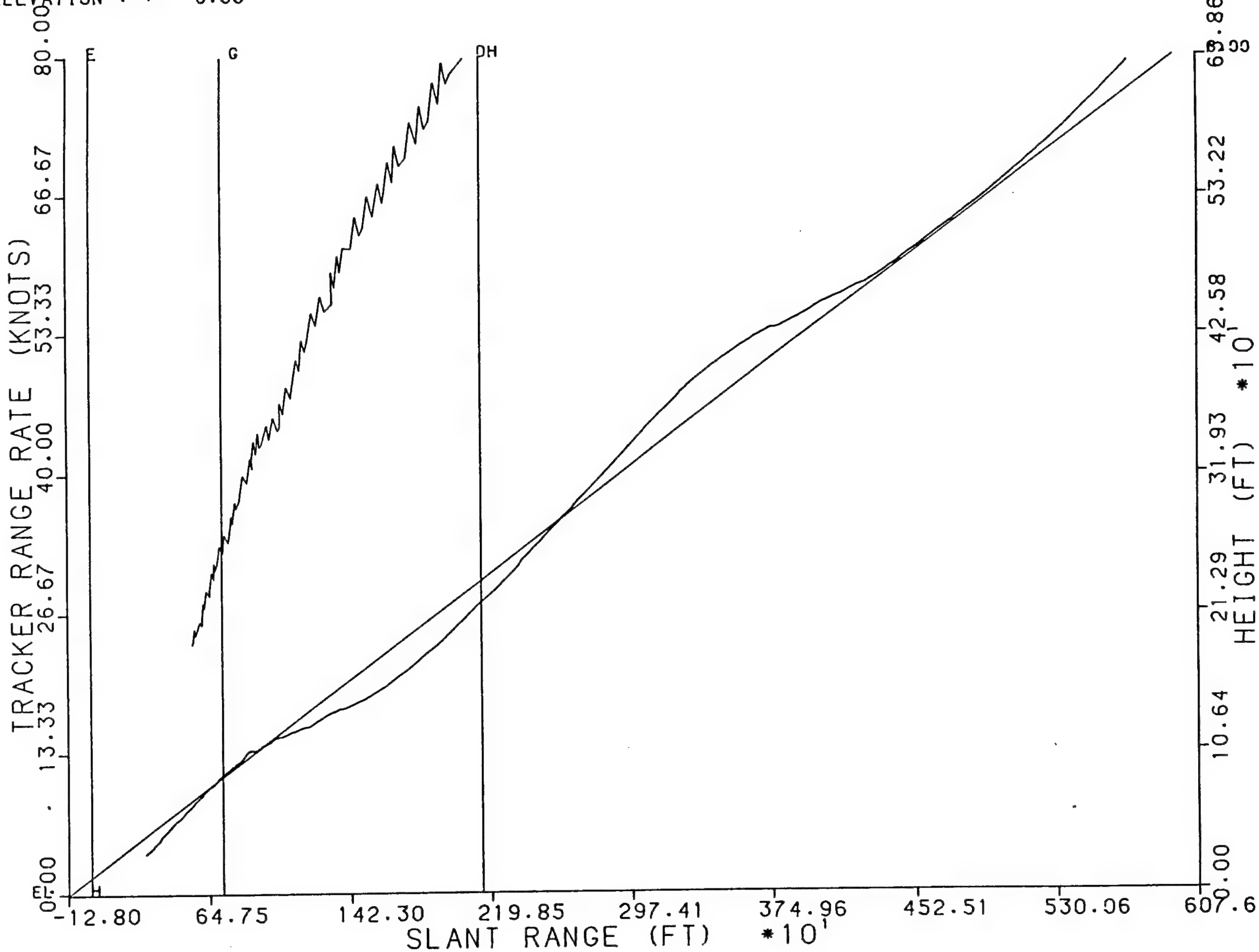
RUN # 8

4/28/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 143 DEGREE AZ ON

AZIMUTH : +- 0.00

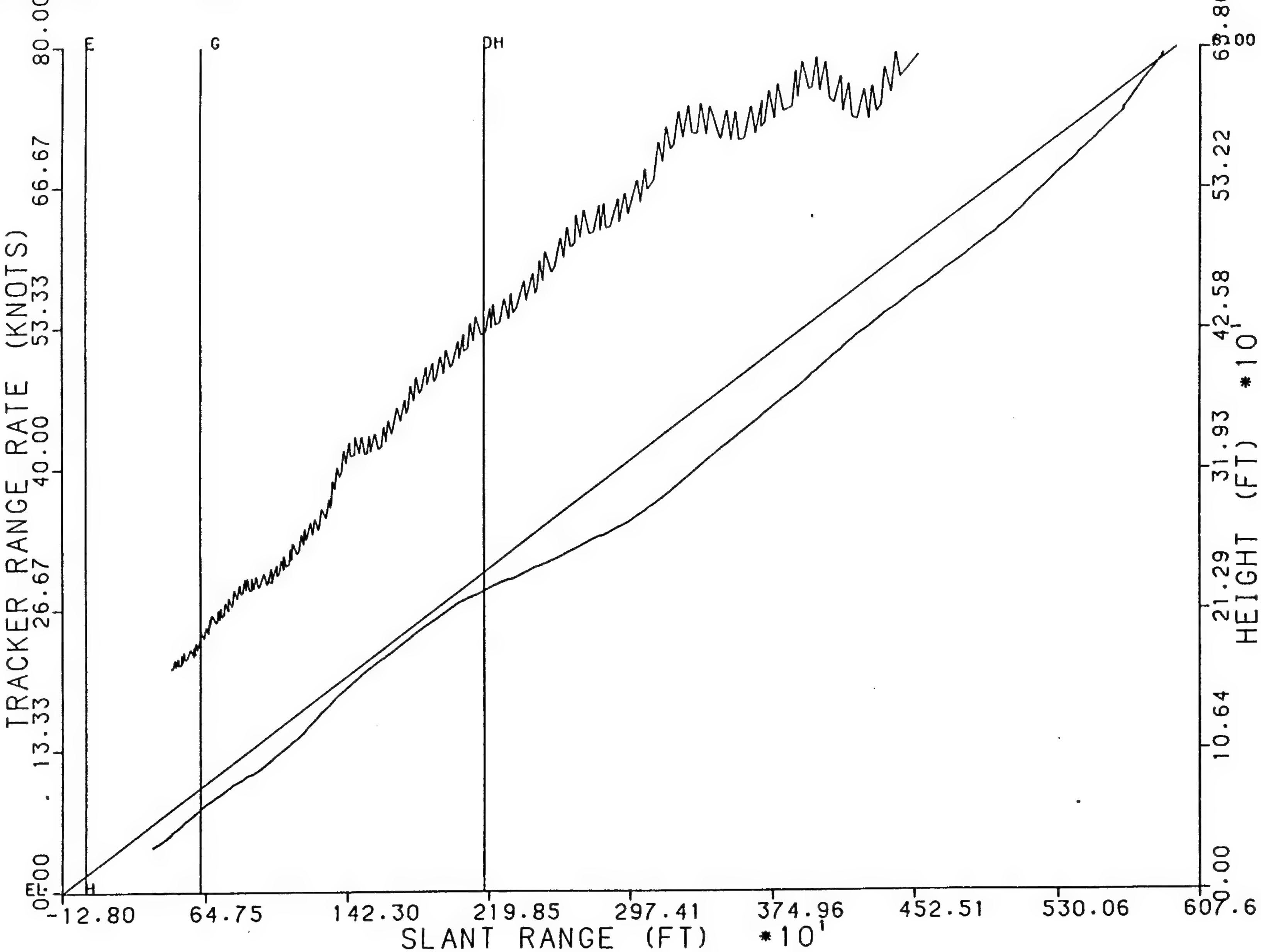
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



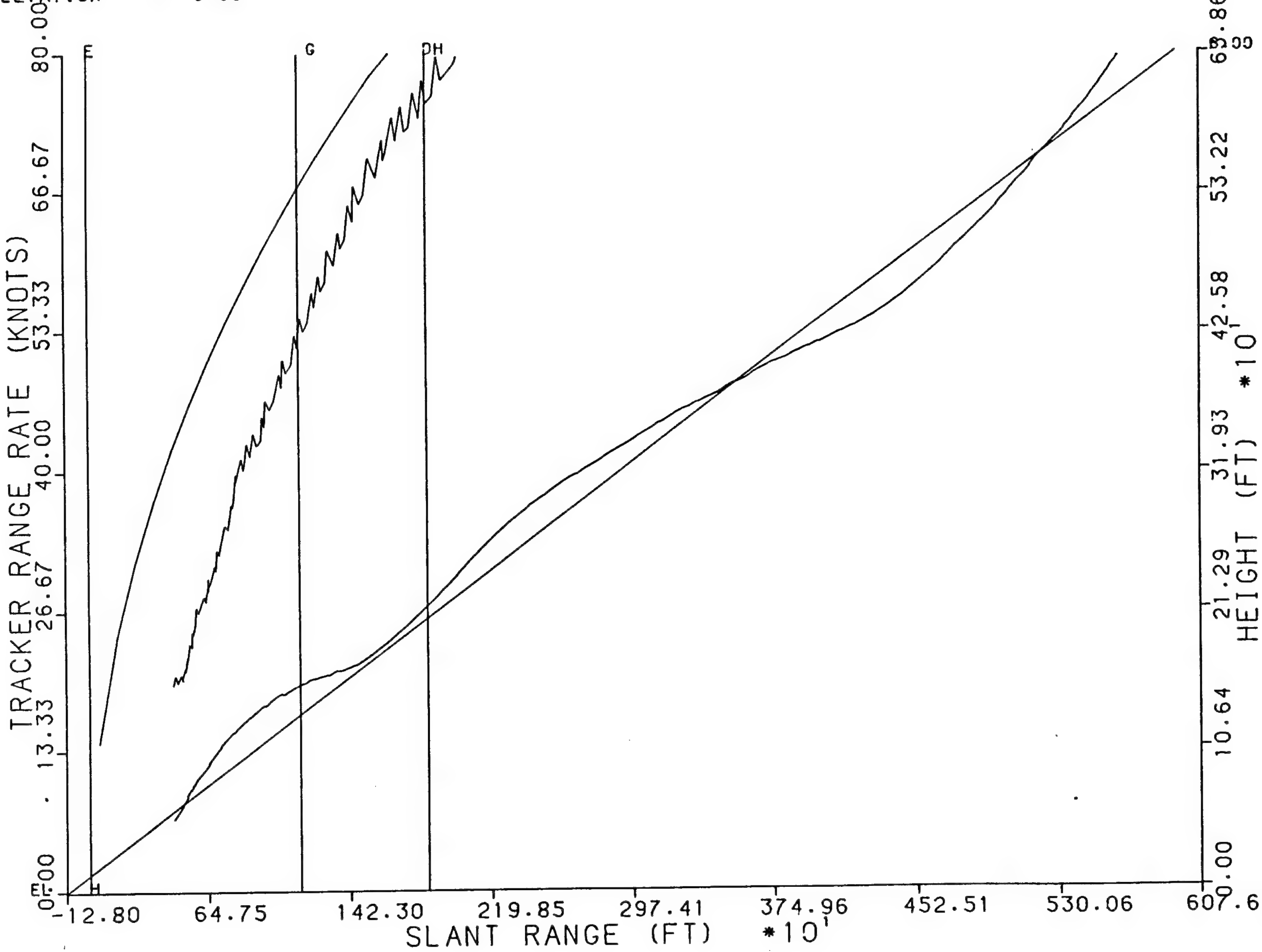
RUN # 9
4/28/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 138 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 10
4/28/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 148 DEGREE AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



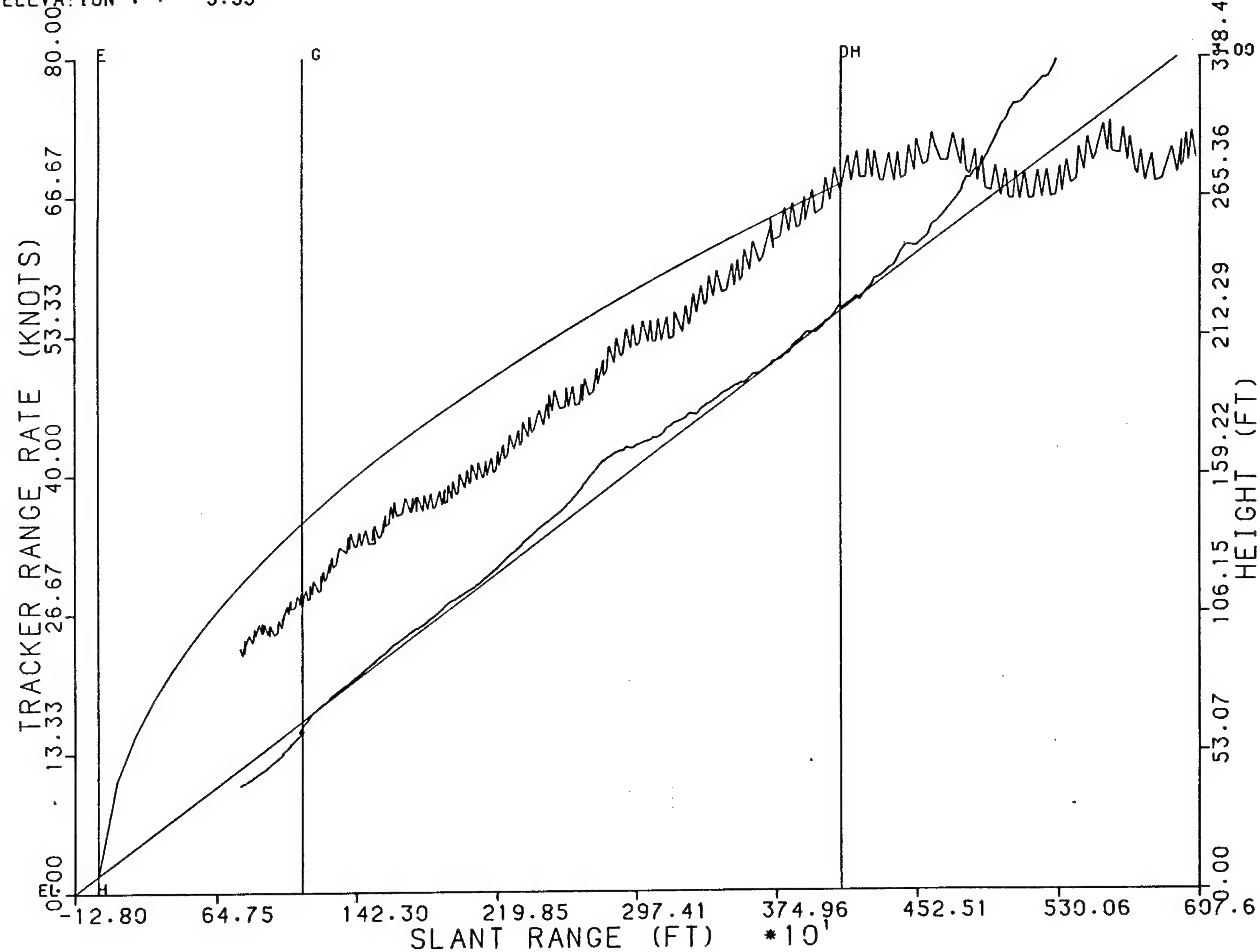
RUN # 1

4/20/88 UH1 HALS 3 DEG 200 FT DH CL STEP 1 LANDING

AZIMUTH : +- 0.00

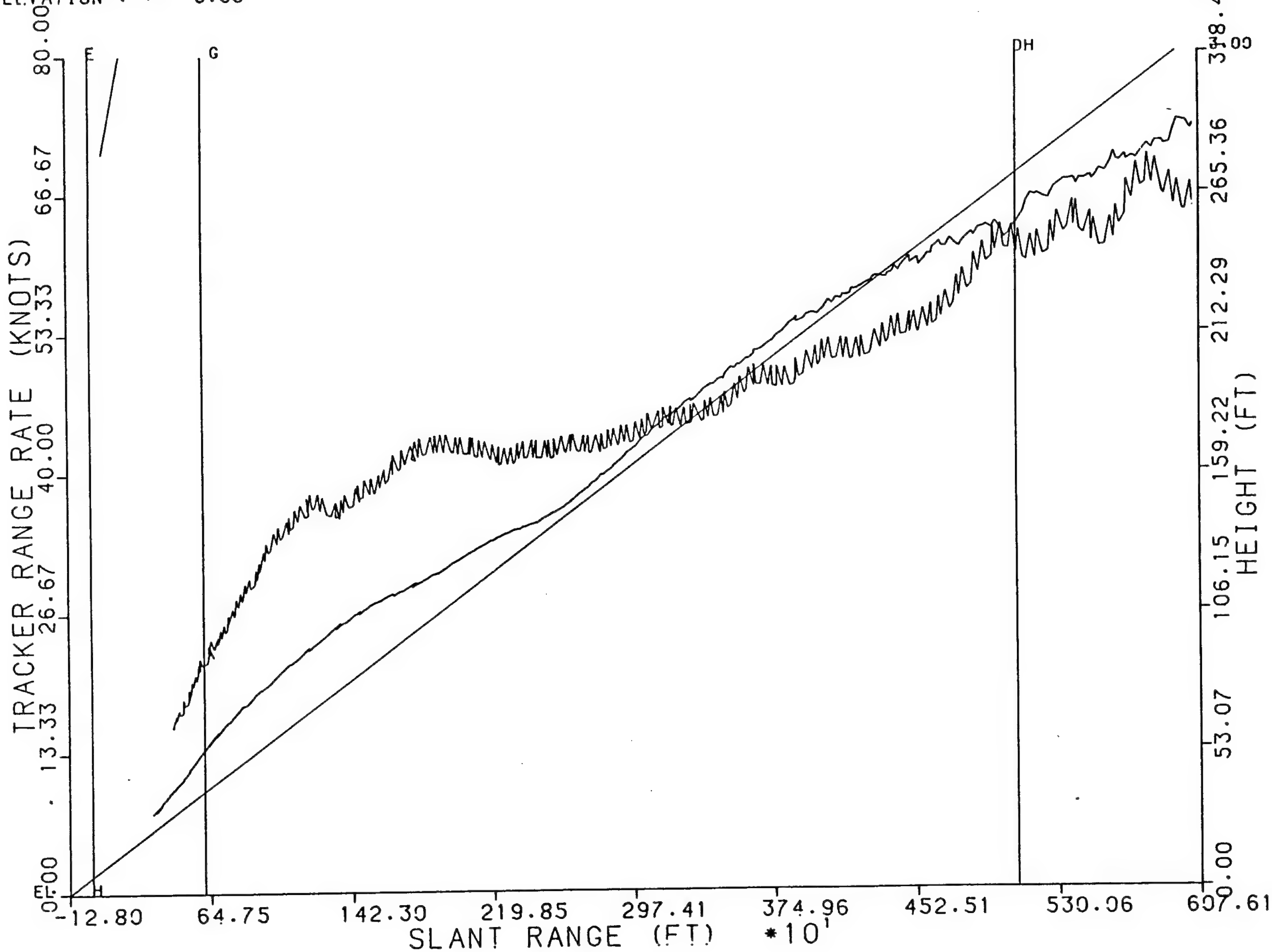
ELEVATION : +- 3.00

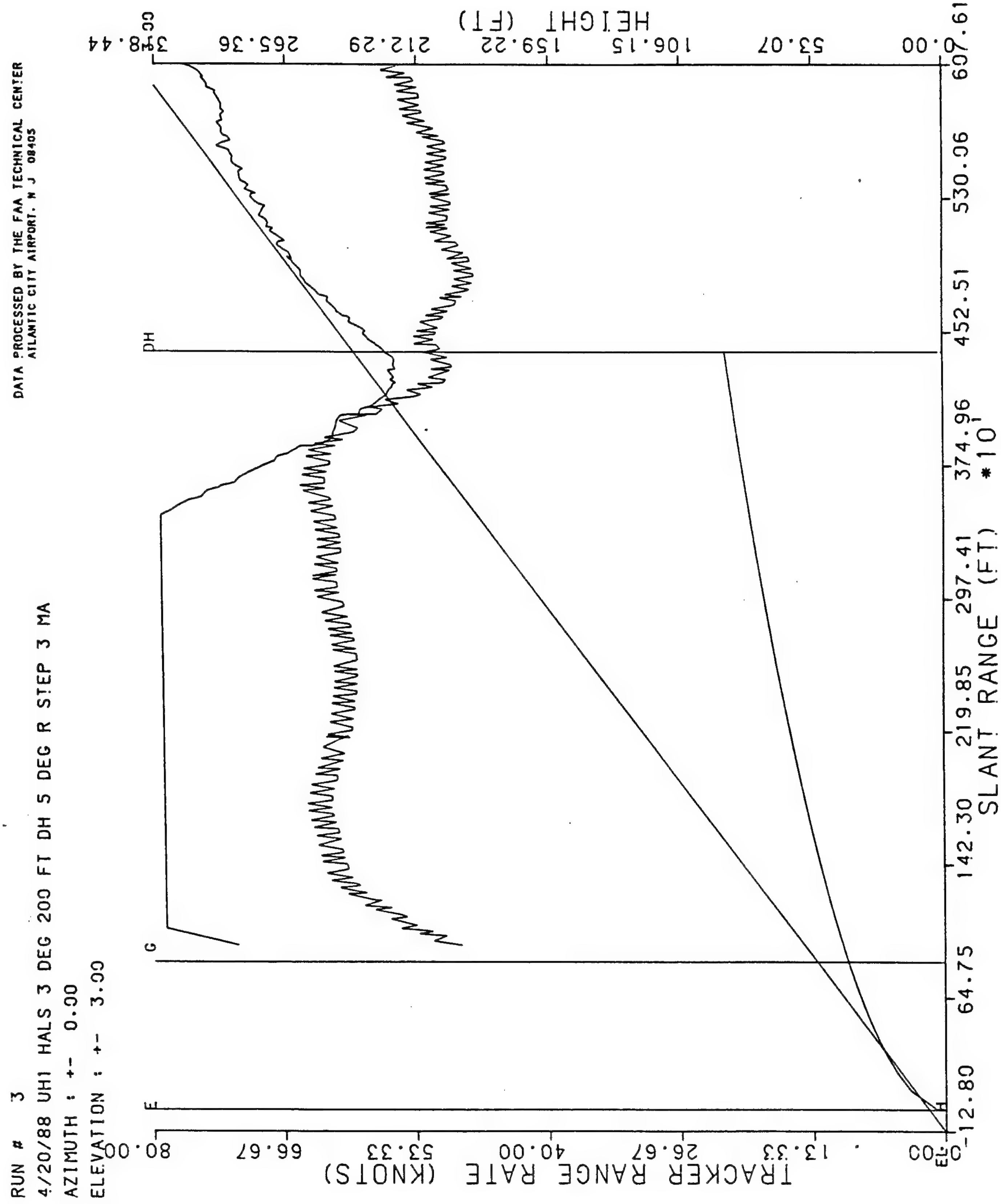
DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 2
4/20/88 UH1 HALS 3 DEG 200 FT DH CL OFF LANDING
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

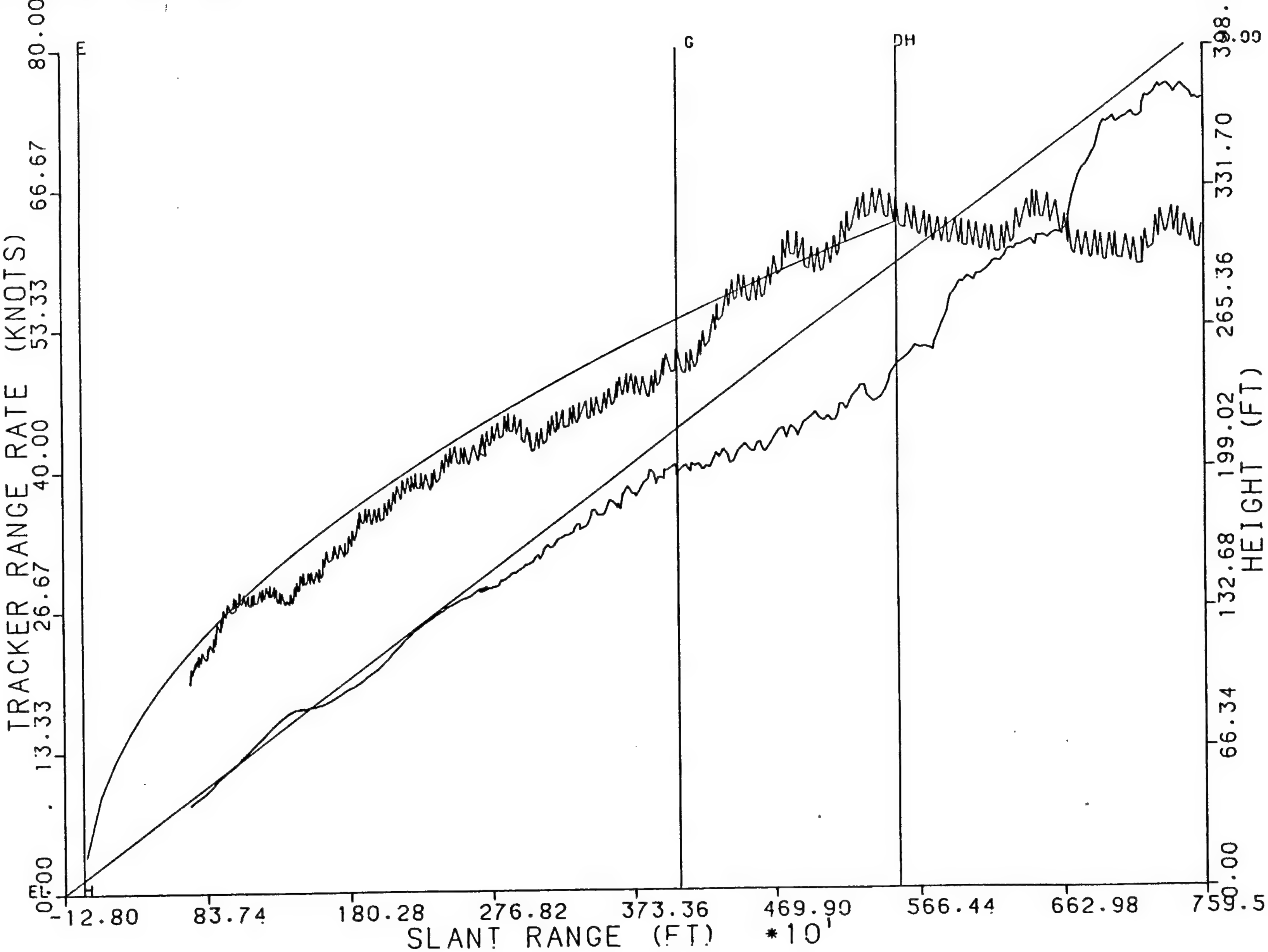
DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT. N J 08405




RUN # 3
4/20/88 UH1 HALS 3 DEG 200 FT DH 5 DEG R STEP 3 MA
AZIMUTH : +- 0.00
ELEVATION : +- 3.00
DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405
TRACKER RANGE RATE (KNOTS)
80.00
66.67
53.33
40.00
26.67
13.33
0.00
HEIGHT (FT)
318.44
265.36
212.29
159.22
106.15
53.07
0.00
SLANT RANGE (FT) *10¹
-12.80
64.75
142.30
219.85
297.41
374.96
452.51
530.06
607.61
E
G
DH
GC
EL

RUN # 4
4/20/88 UH1 HALS 3 DEGREE 200 FT DH 5 DEG L OFF LANDING
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



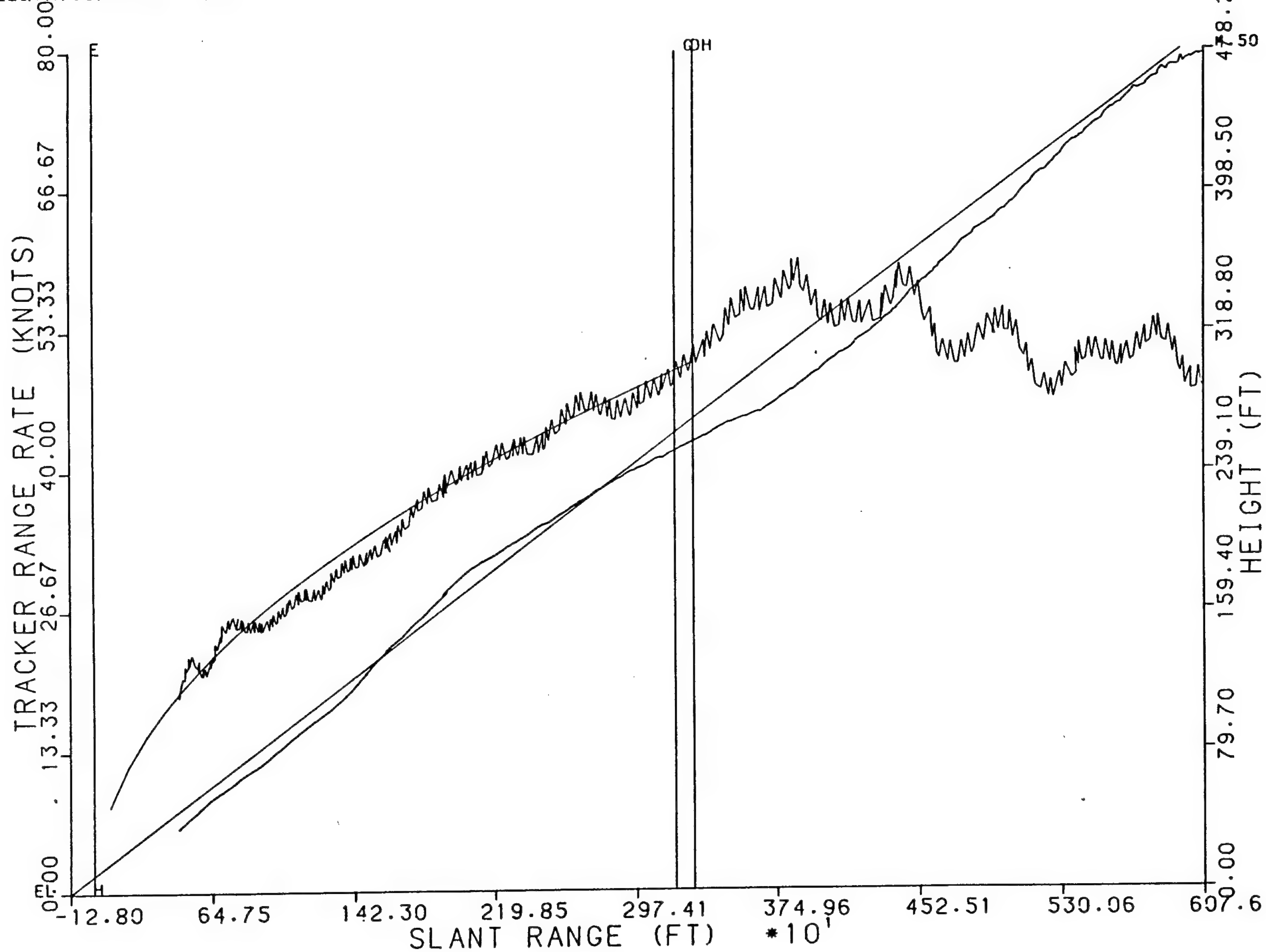
RUN # 5

4/20/88 UH1 HALS 4.5 DEGREE 250 FT DH CL STEP 3 LANDING

AZIMUTH : +- 0.00

ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT. N J 08405



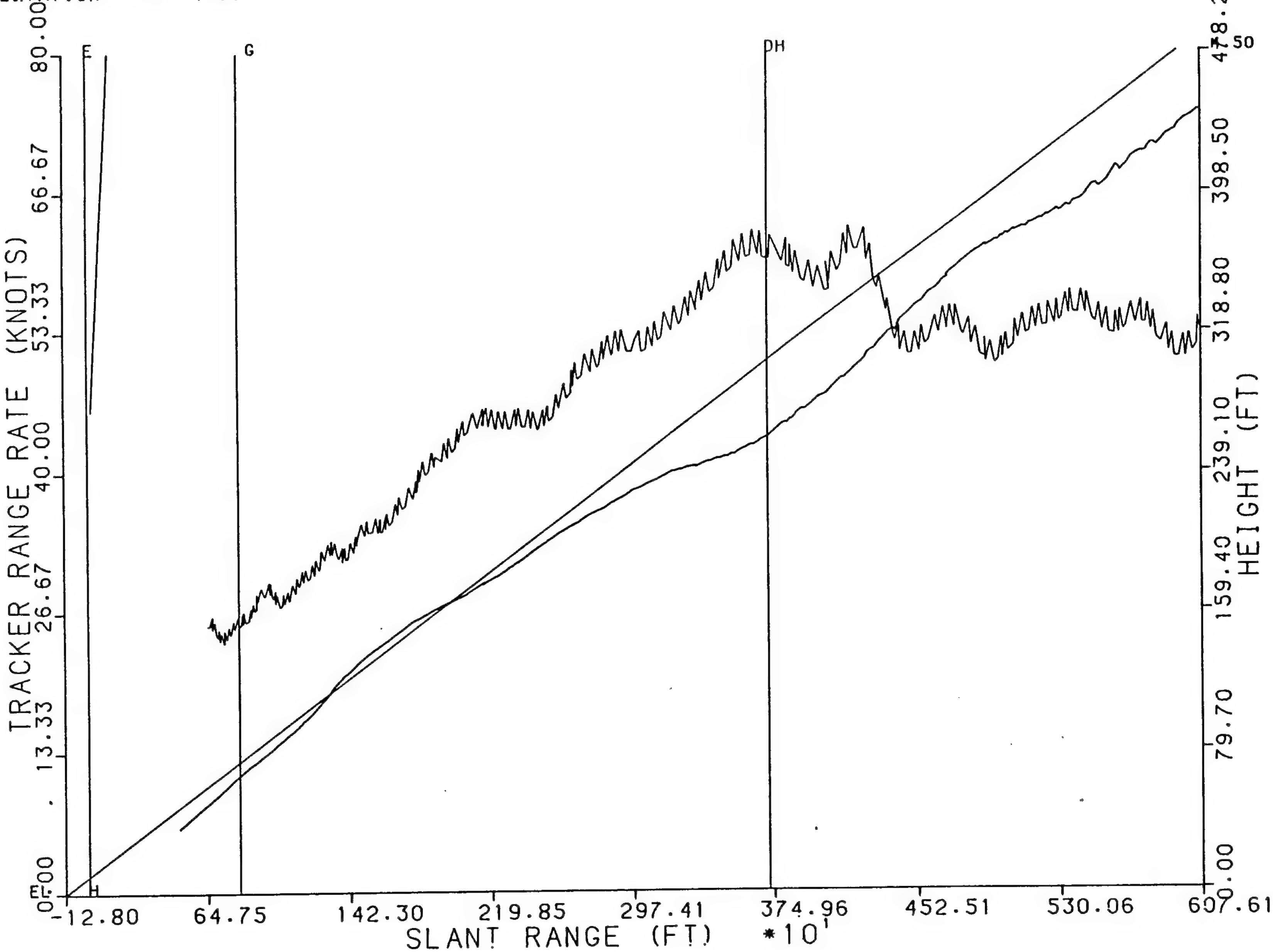
RUN # 6

4/20/88 UH1 HALS 4.5 DEGREE 250 FT DH CL OFF LANDING

AZIMUTH : +- 0.00

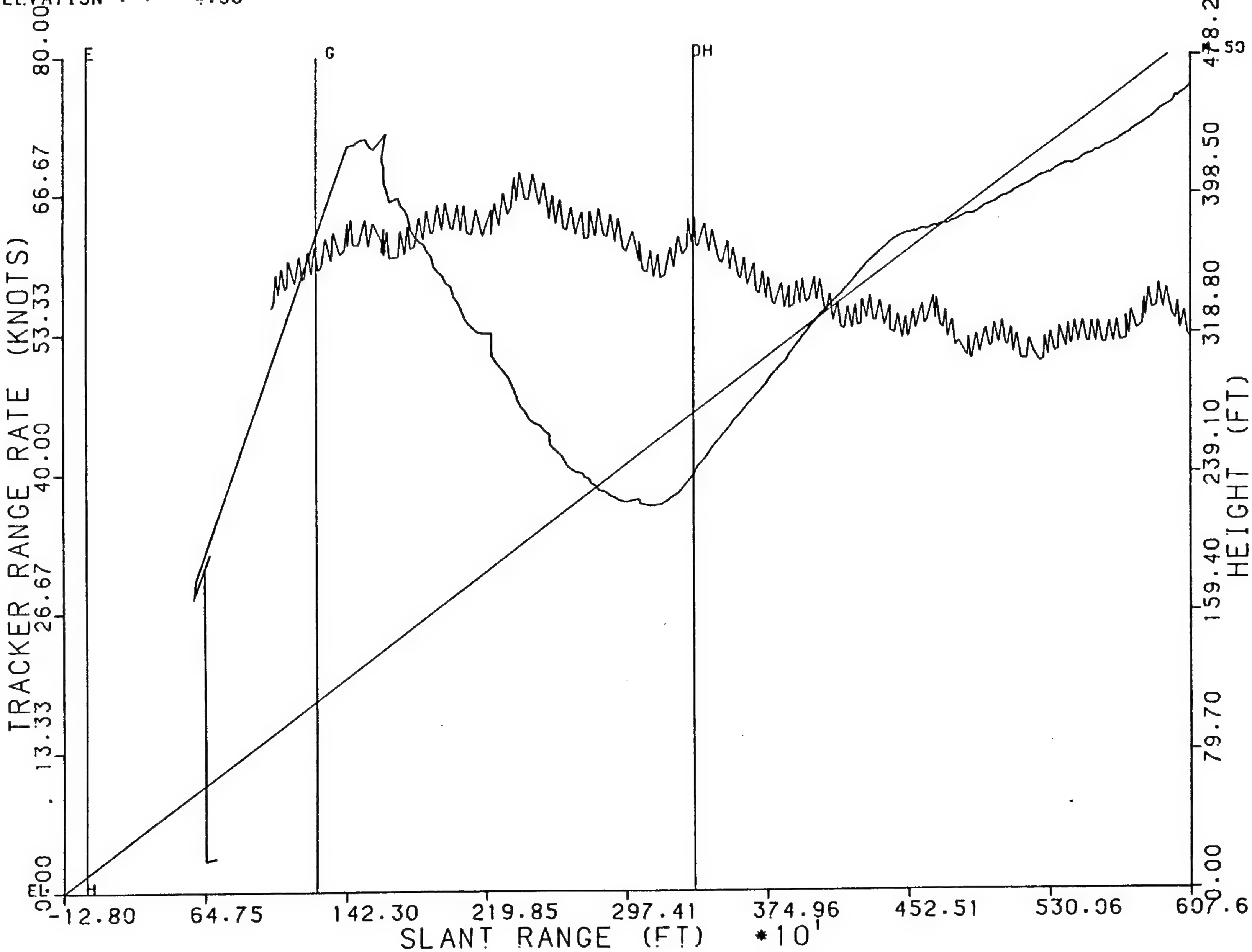
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 7
4/20/88 UH1 HALS 4.5 DEGREE 250 FT DH 5 DEG RT STEP 1 MA
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT. N J 08405



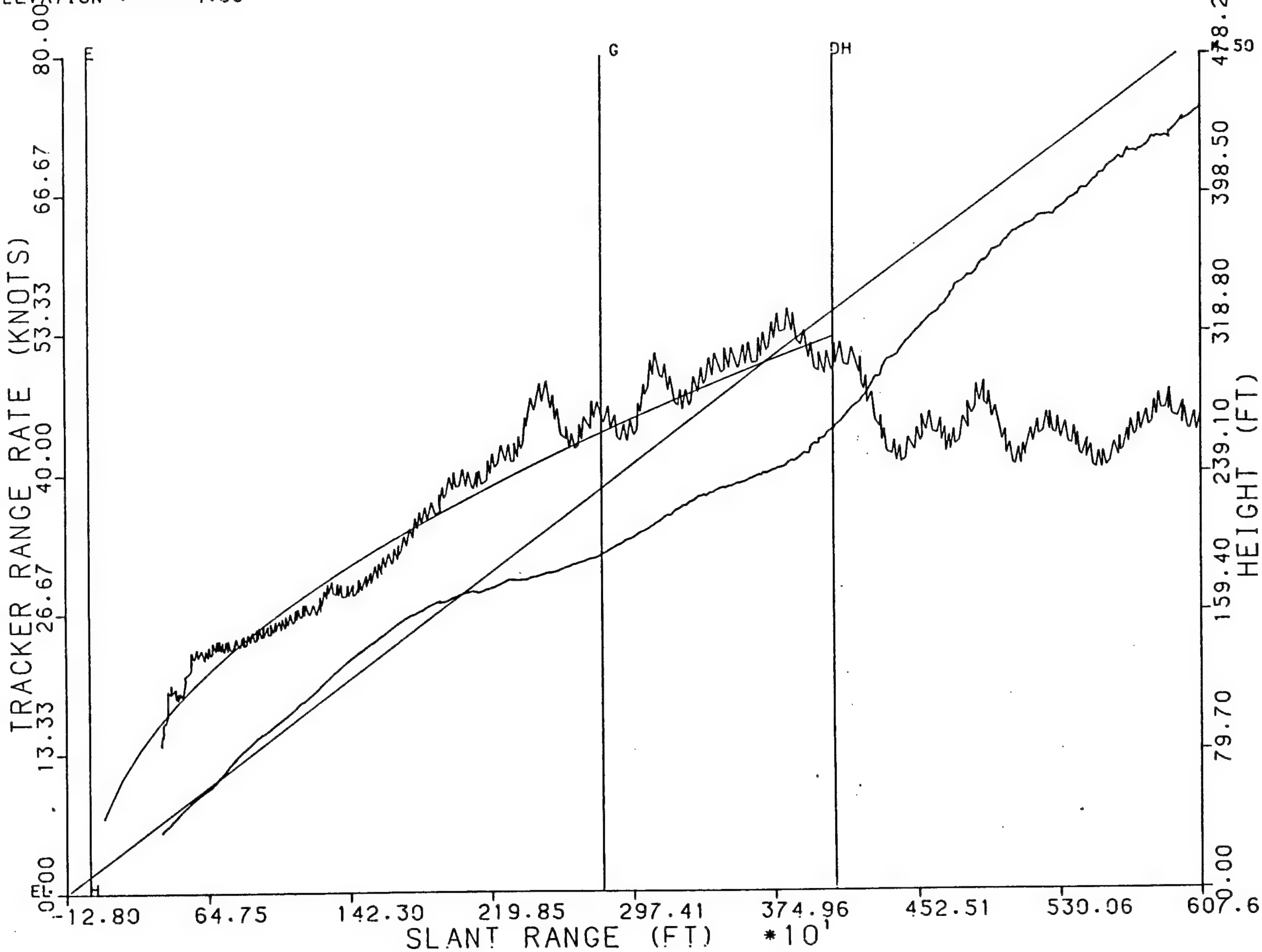
RUN # 8

4/20/88 UH1 HALS 4.5 DEGREE 250 FT DH 5 DEG L STEP 1 LANDING

AZIMUTH : +- 0.00

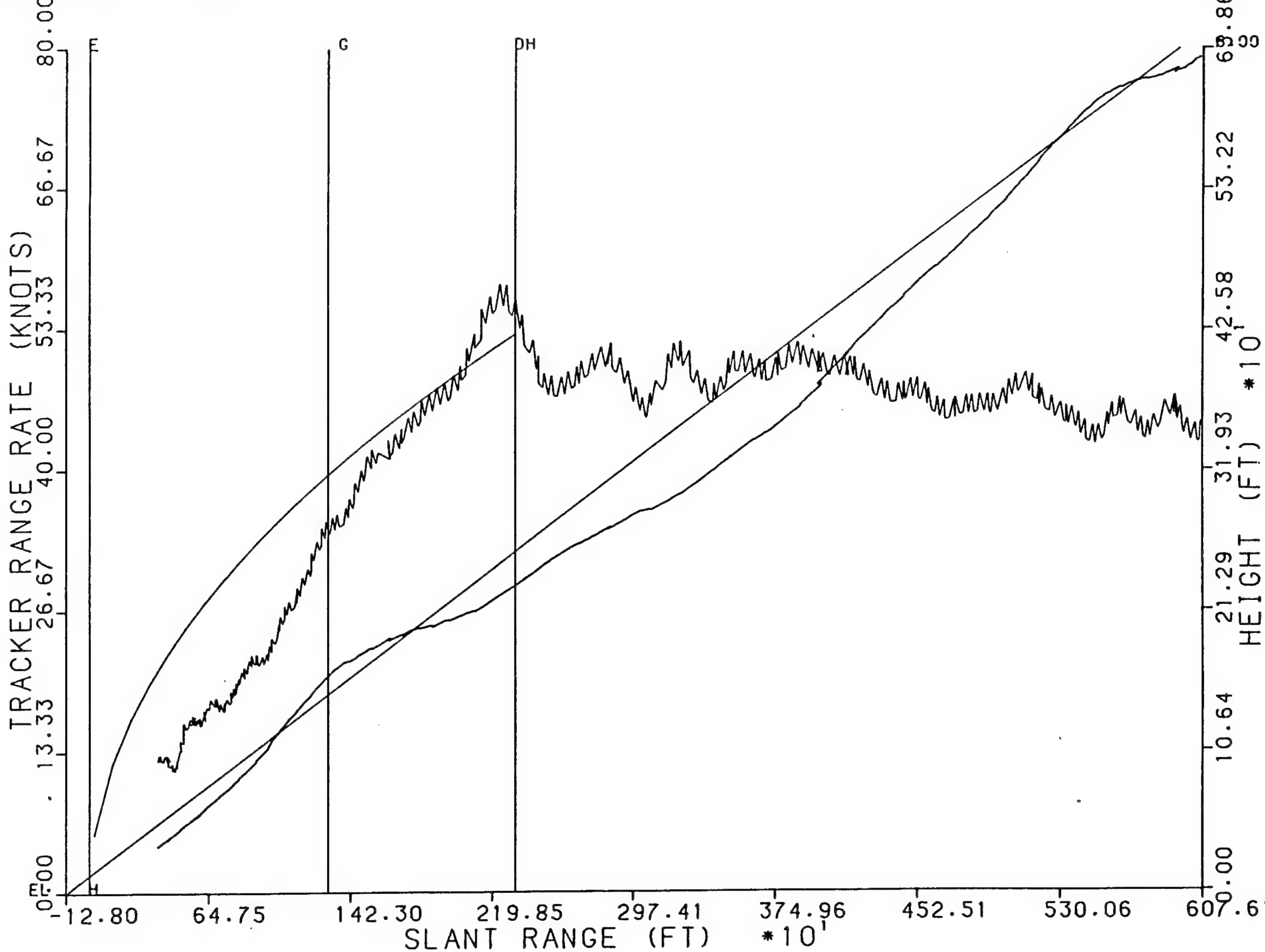
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



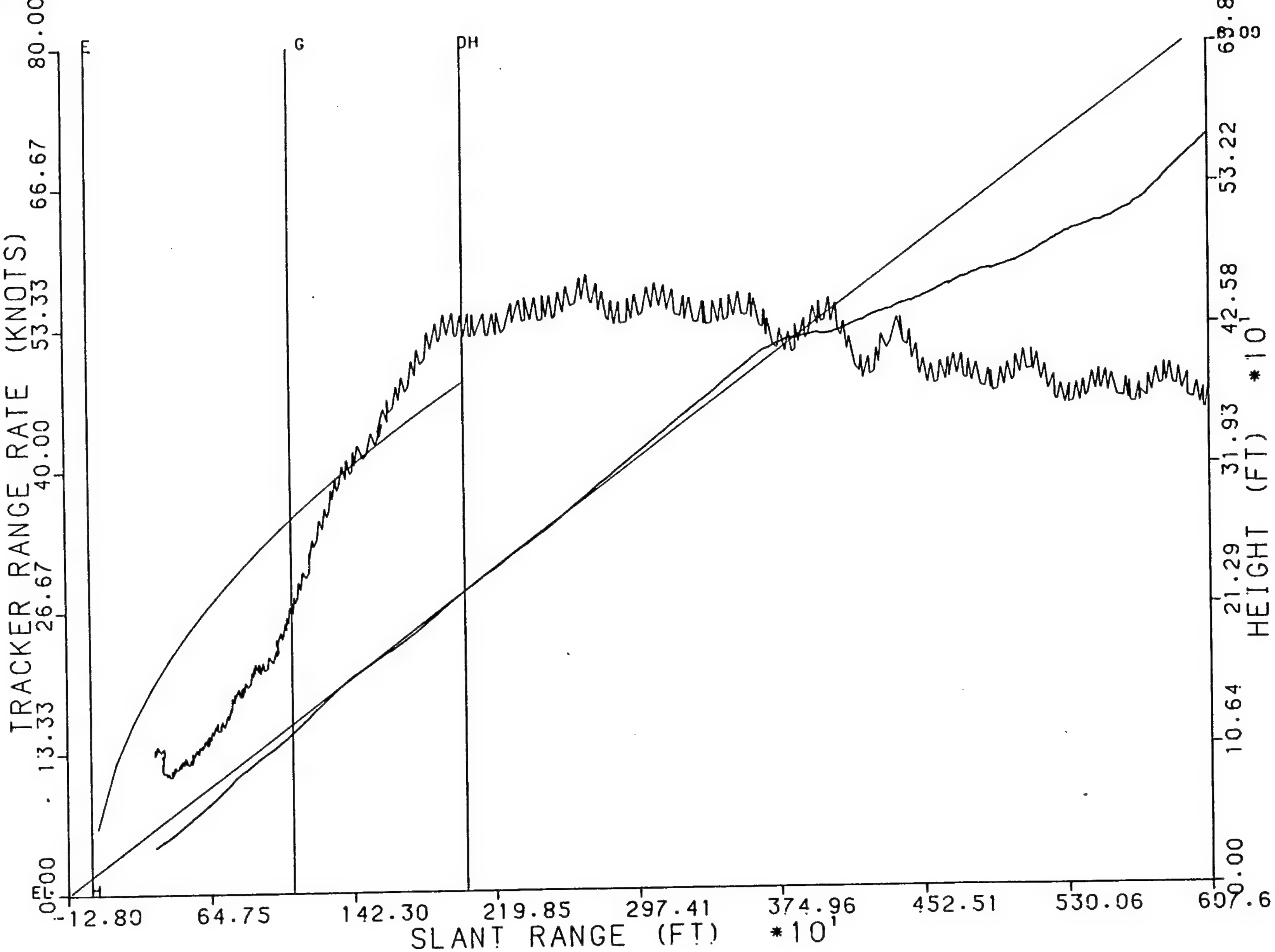
RUN # 9
4/20/88 UH1 HALS 6.0 DEGREE 250 FT DH CL STEP 1 LANDING
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 10
4/20/88 UH1 HALS 6.0 DEGREE 250 FT DH CL OFF LANDING
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



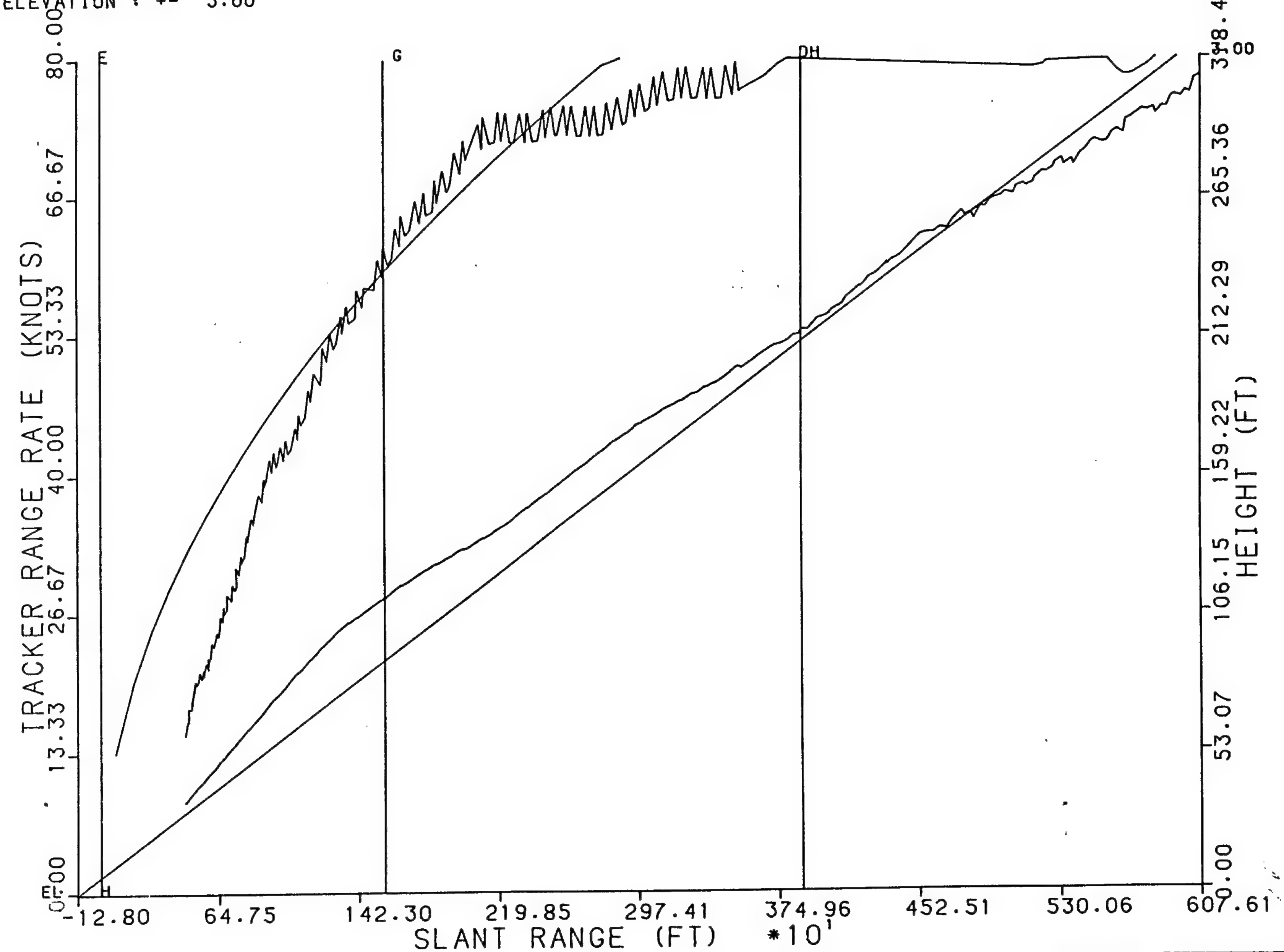
RUN # 1

4/26/88 UH1 HALS 3 DEGREE EL 200 FT DH 143 DEGREE AZ ON STEP 1

AZIMUTH : +- 0.00

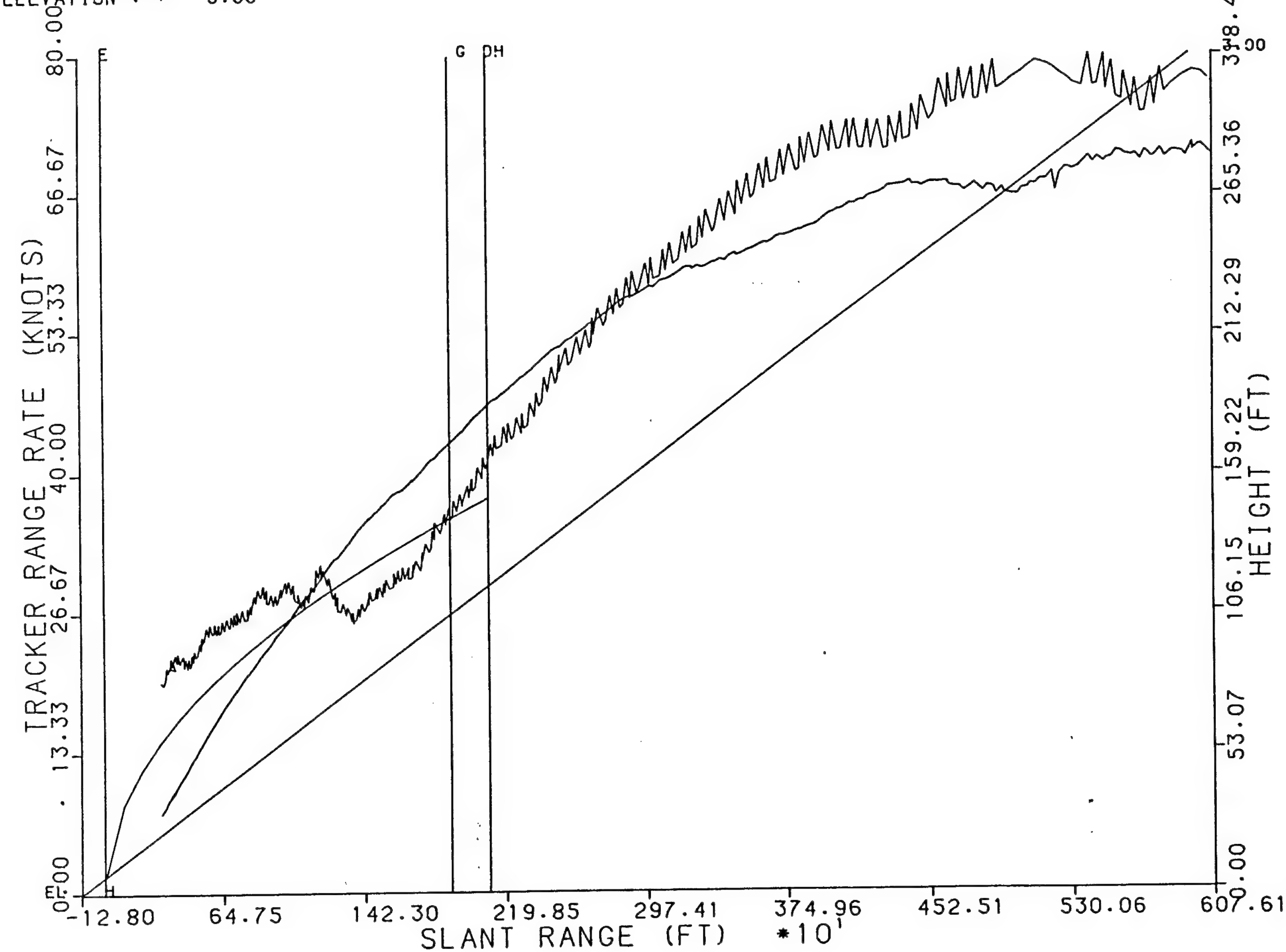
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



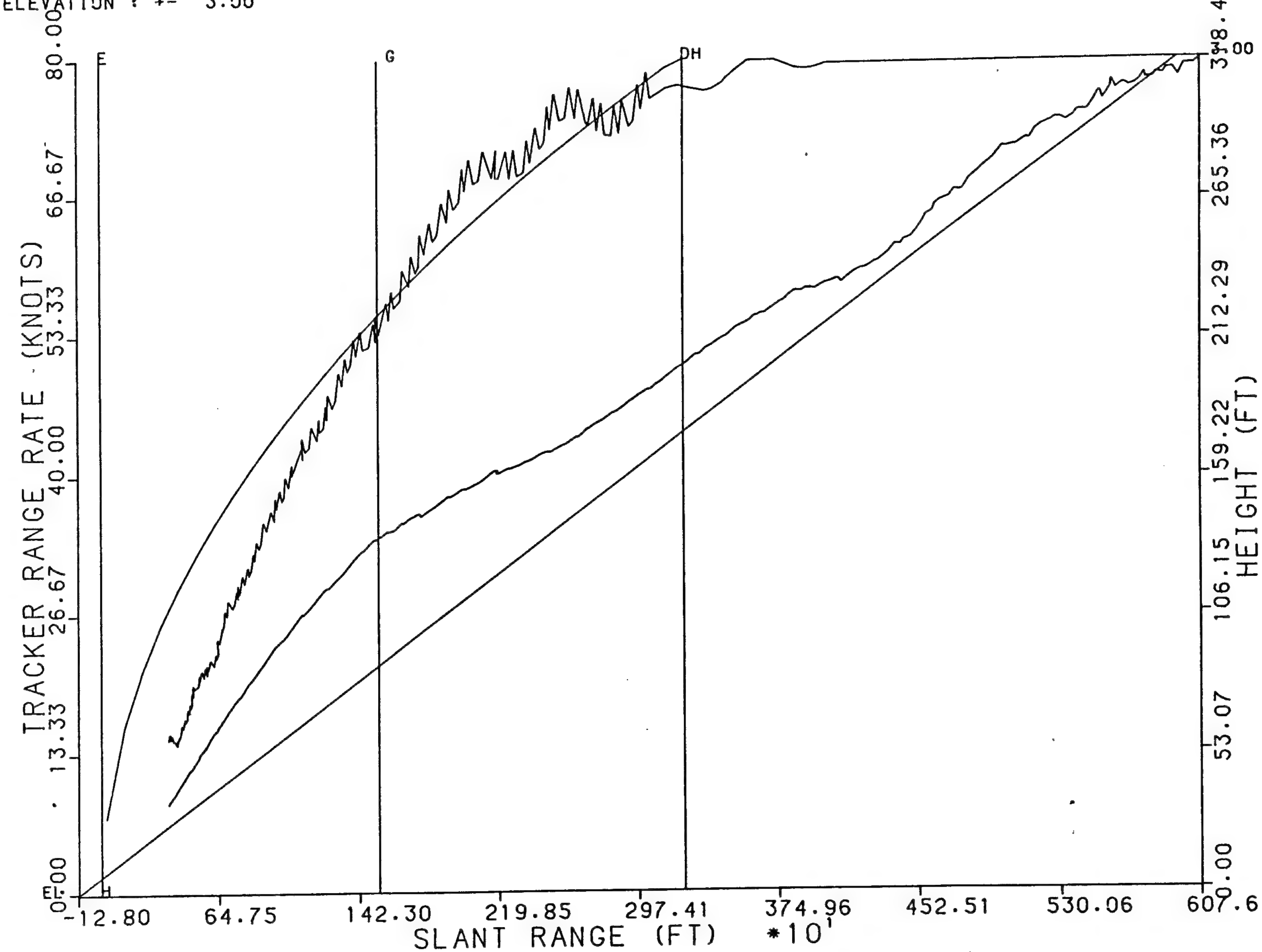
RUN # 2
4/26/88 UH1 HALS 3 DEGREE EL 200 FT DH 143 DEGREE AZ OFF STEP 1
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 3
4/26/88 UH1 HALS 3 DEGREE EL 200 FT DH 138 DEGREE AZ ON STEP 2
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



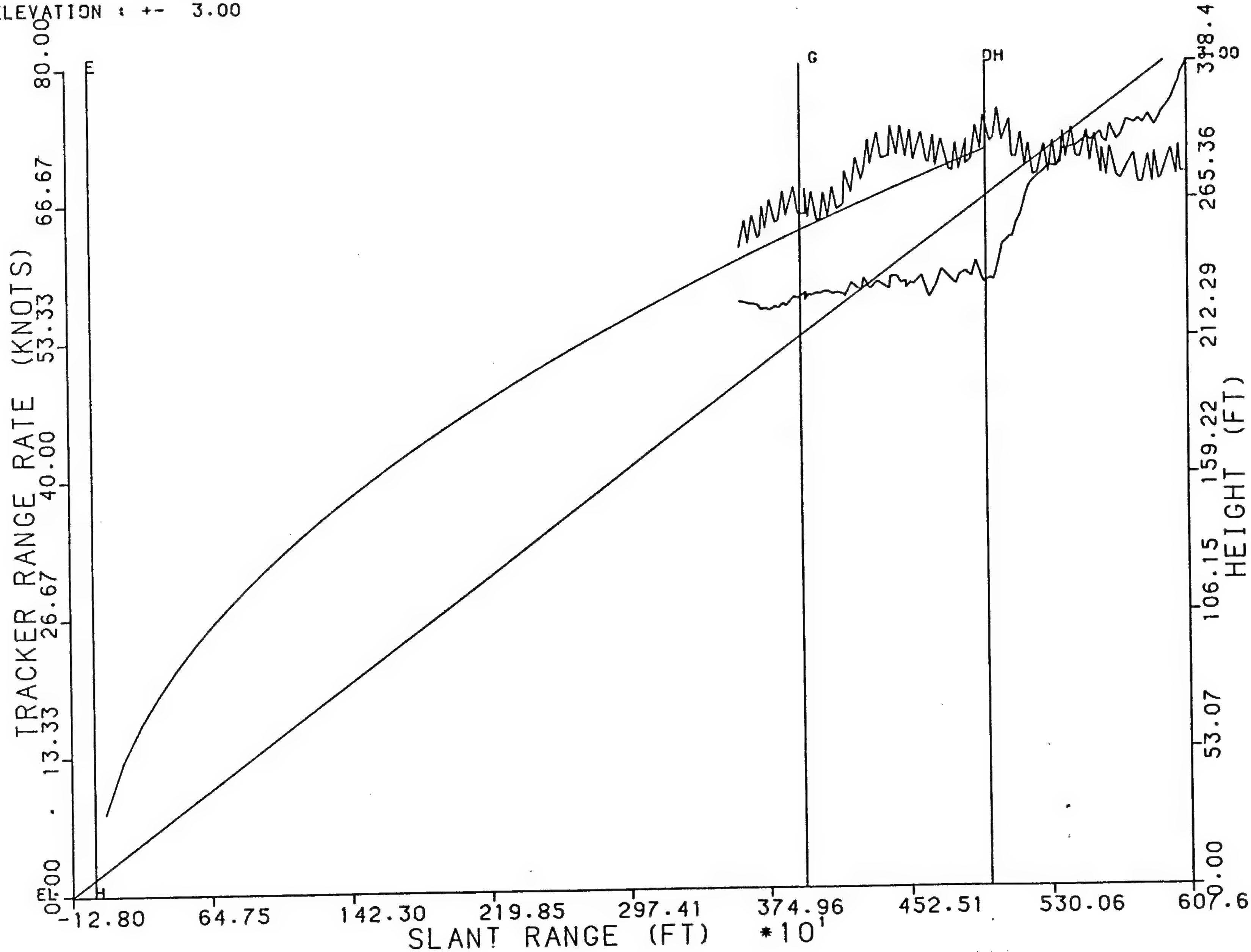
RUN # 4

4/26/88 UH1 HALS 3 DEGREE EL 200 FT DH 148 DEGREE AZ OFF STEP 1

AZIMUTH : +- 0.00

ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



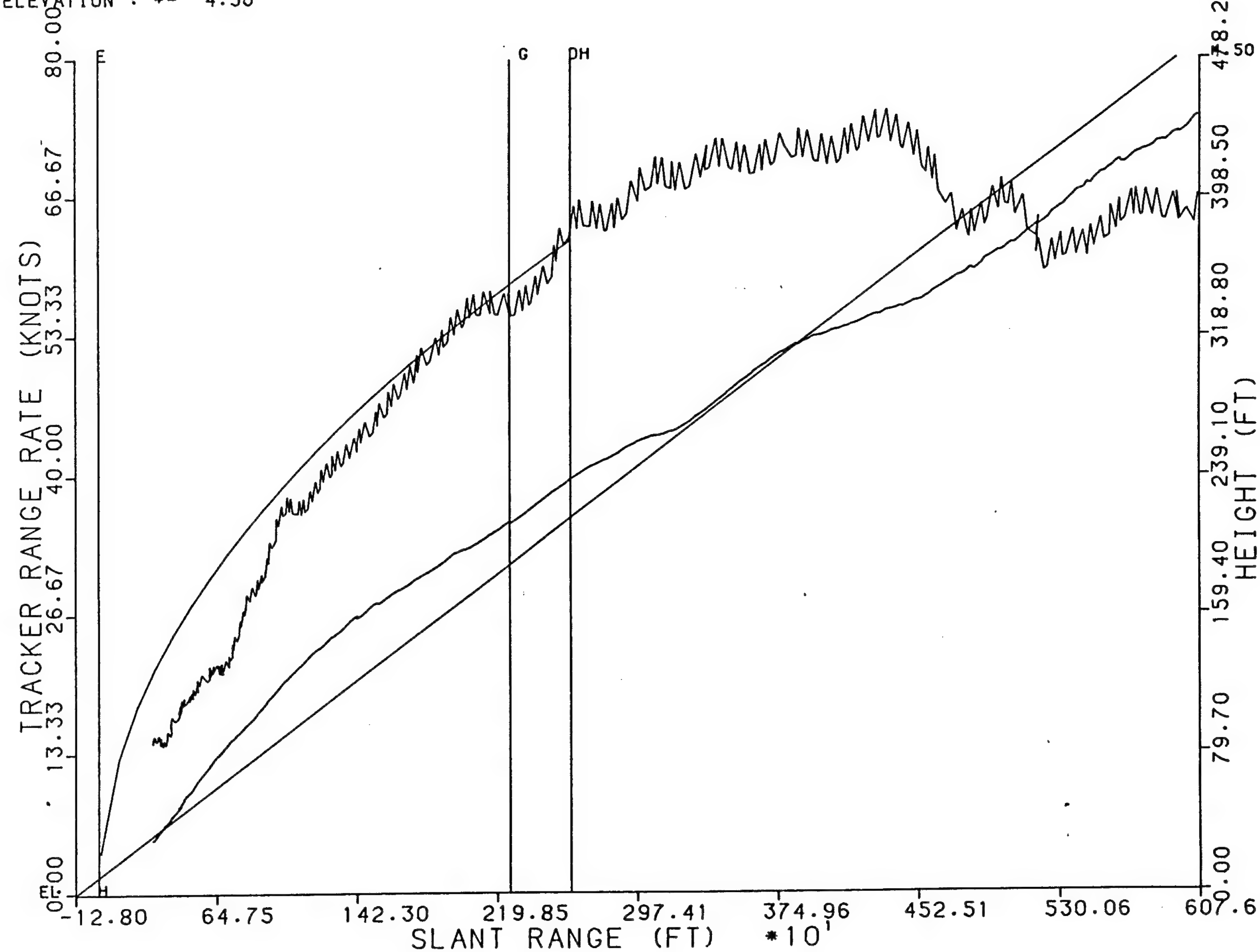
RUN # 5

4/26/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 143 DEGREE AZ ON STEP 1

AZIMUTH : +- 0.00

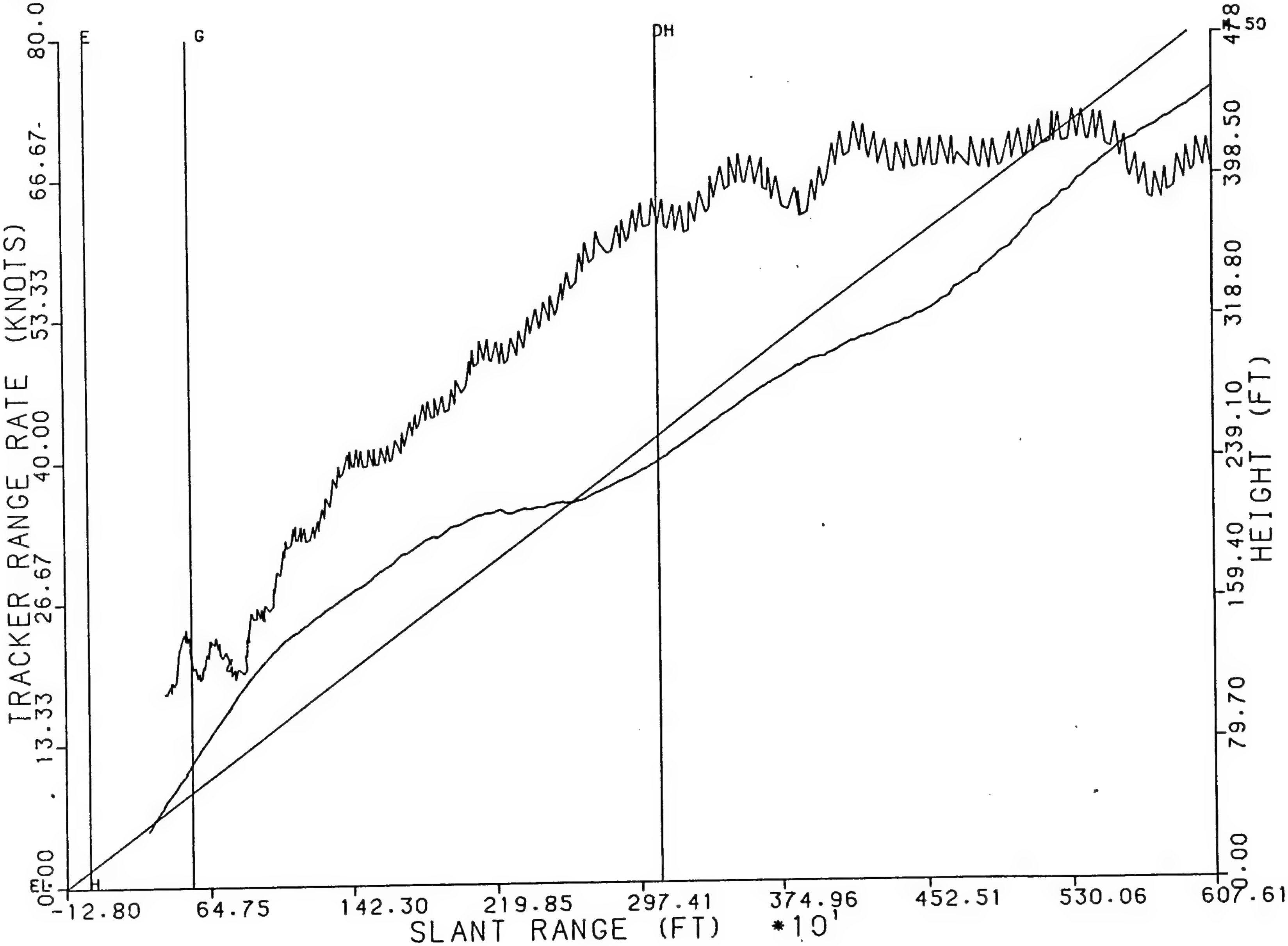
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 6
4/26/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 138 DEGREE AZ OFF STEP 1
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



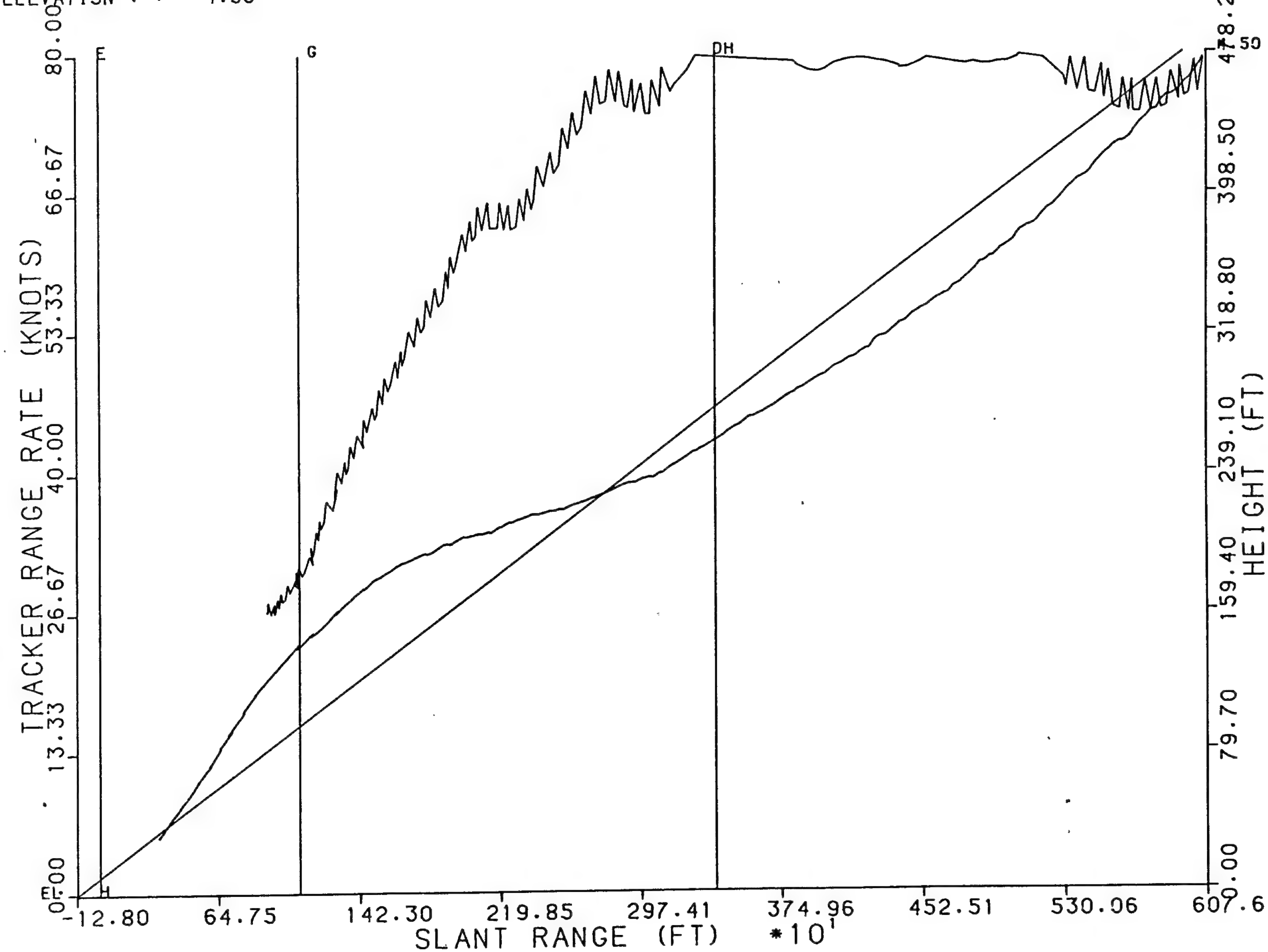
RUN # 7

4/26/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 148 DEGREE AZ OFF STEP 1

AZIMUTH : +- 0.00

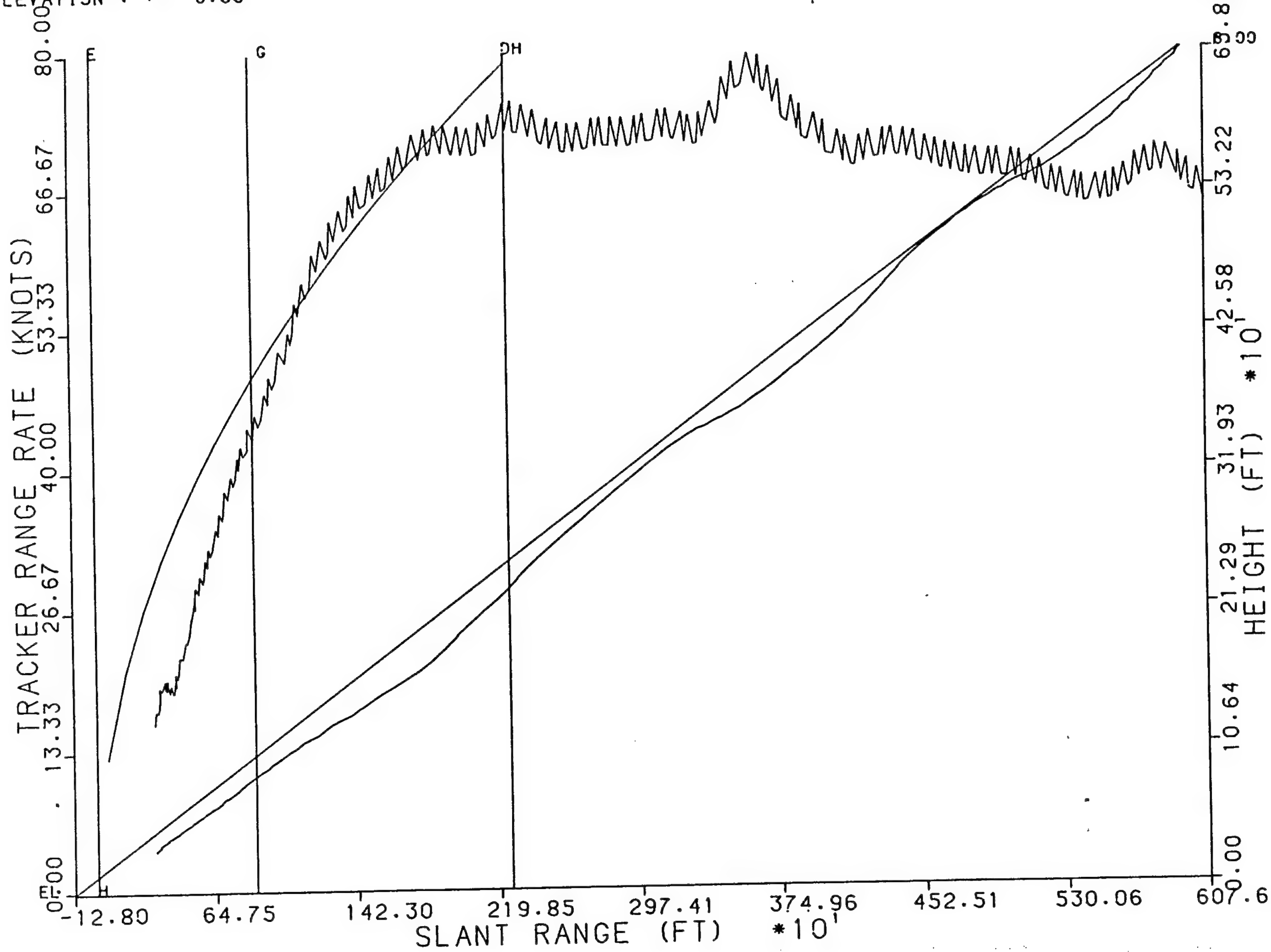
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 8
4/26/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 143 DEGREE AZ ON STEP 1
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



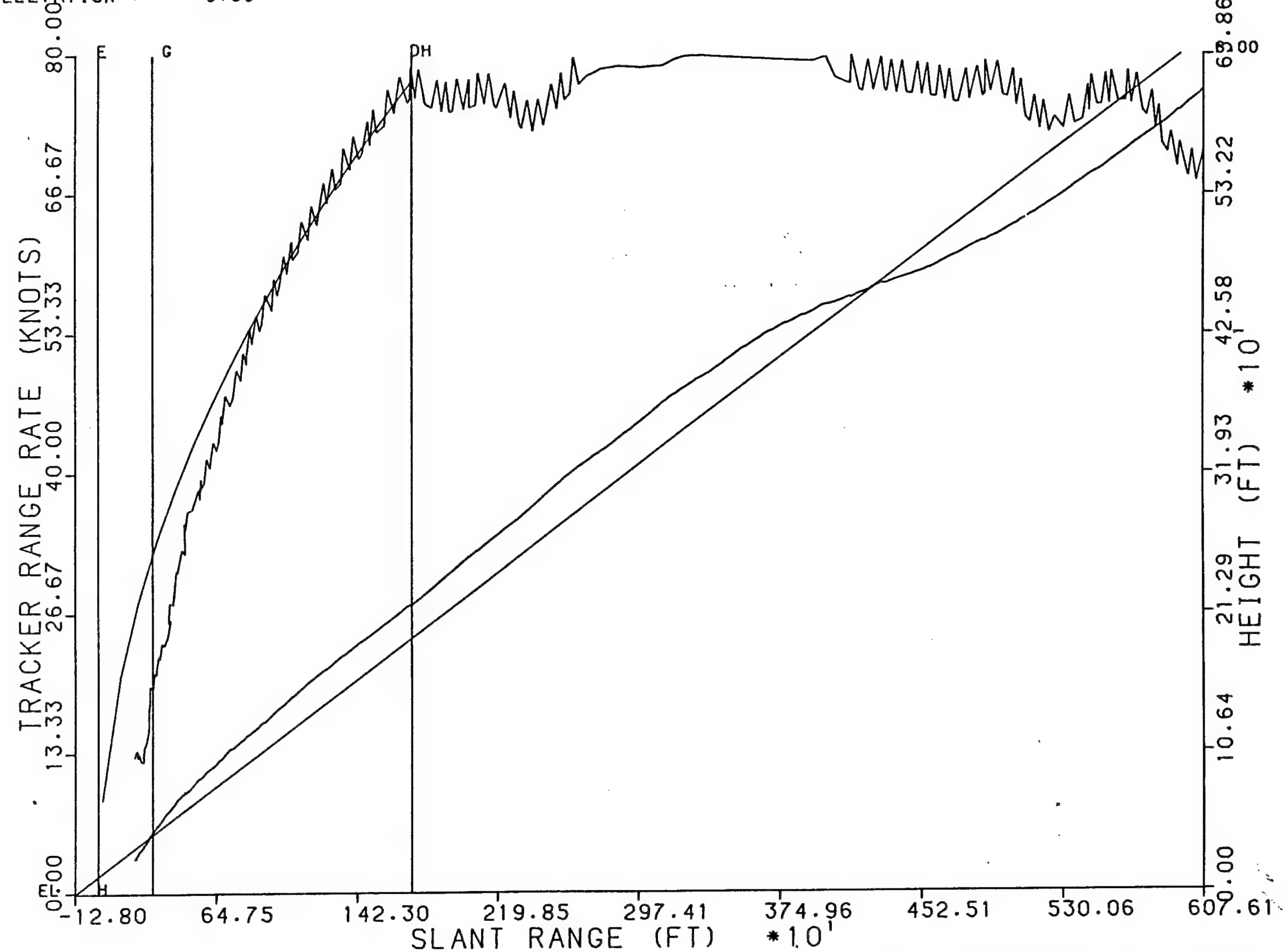
RUN # 9

4/26/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 138 DEGREE AZ ON STEP 1

AZIMUTH : +- 0.00

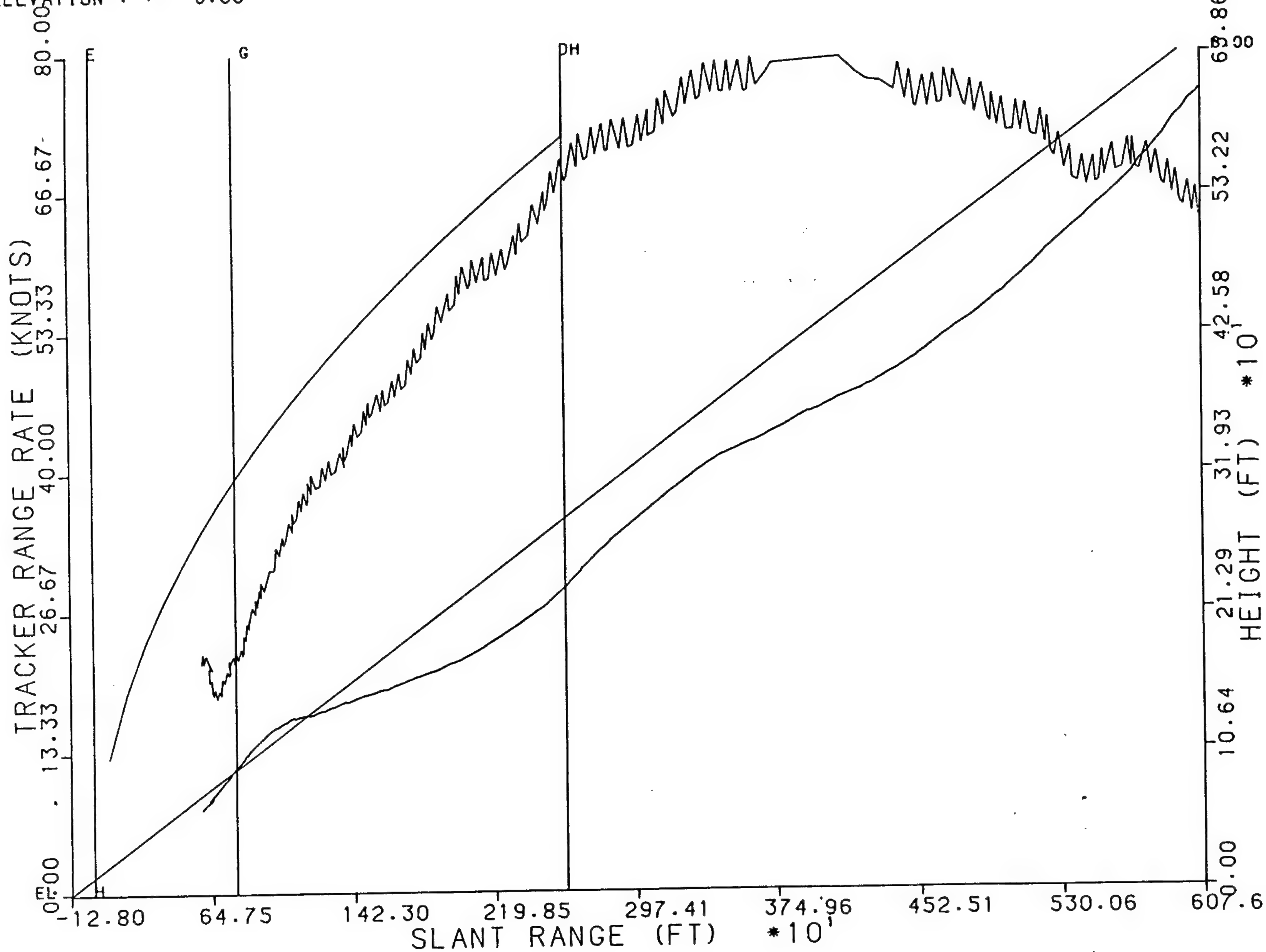
ELEVATION : +- 6.00

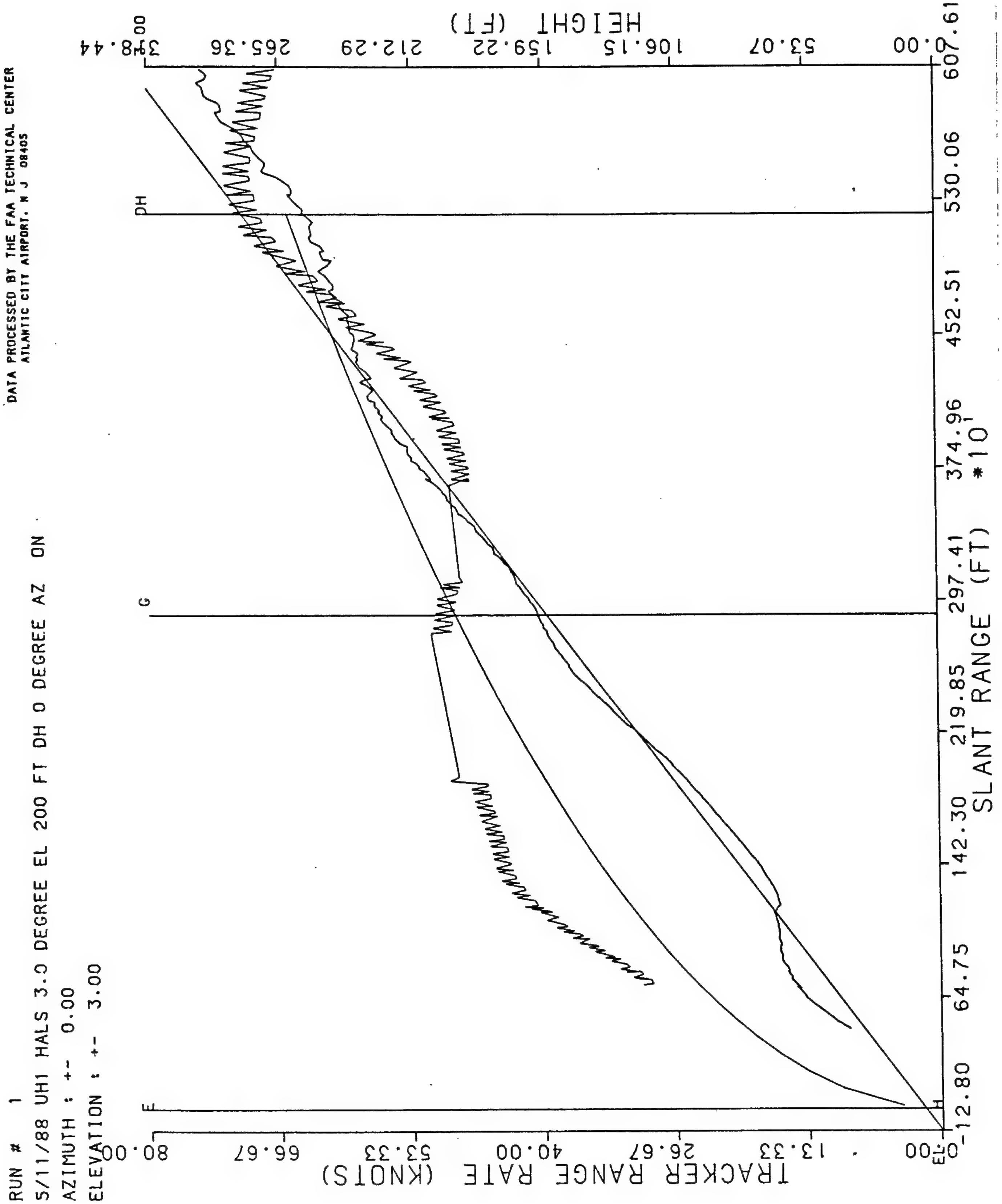
DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



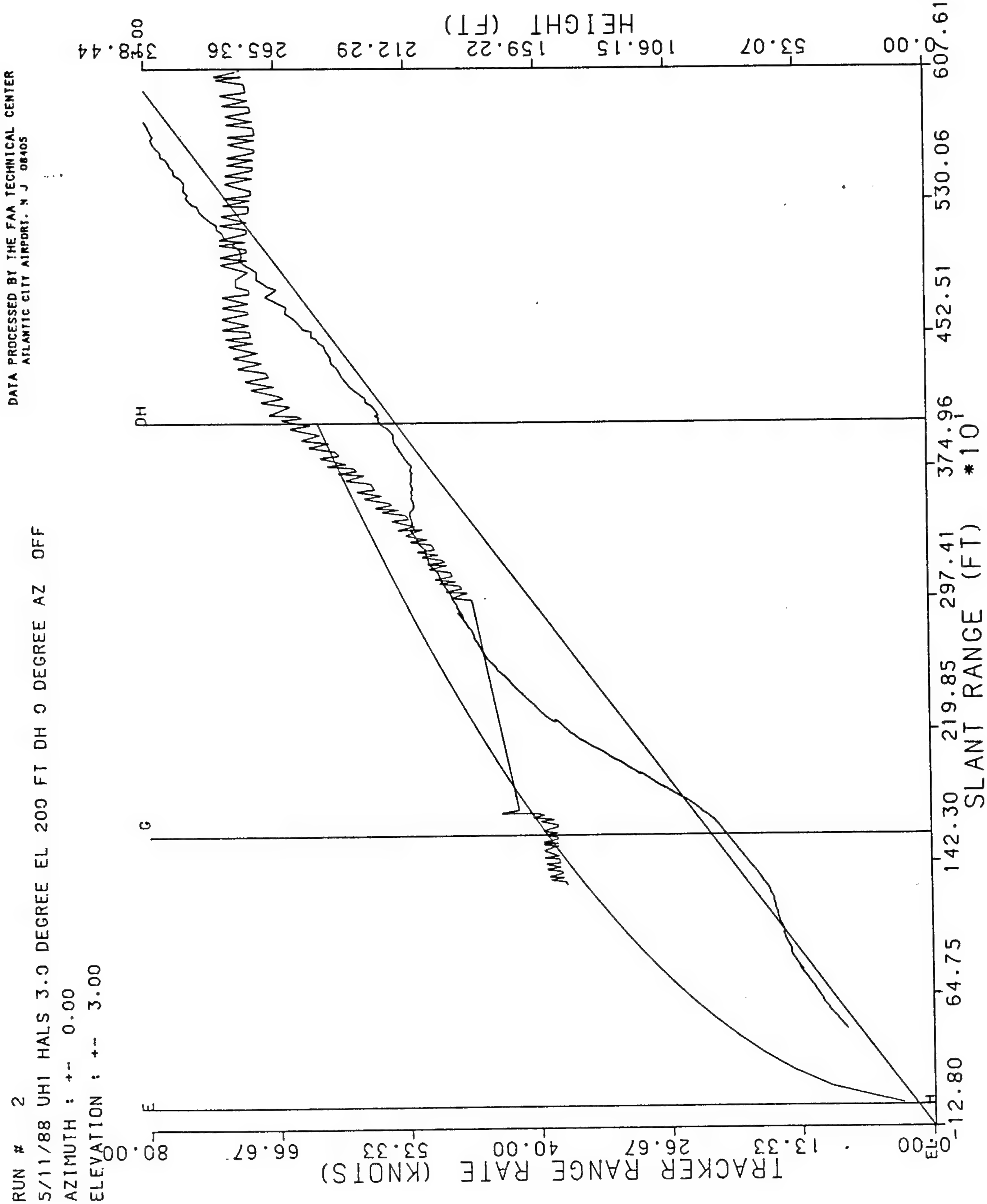
RUN # 10
4/26/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 148 DEGREE AZ OFF STEP 1
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



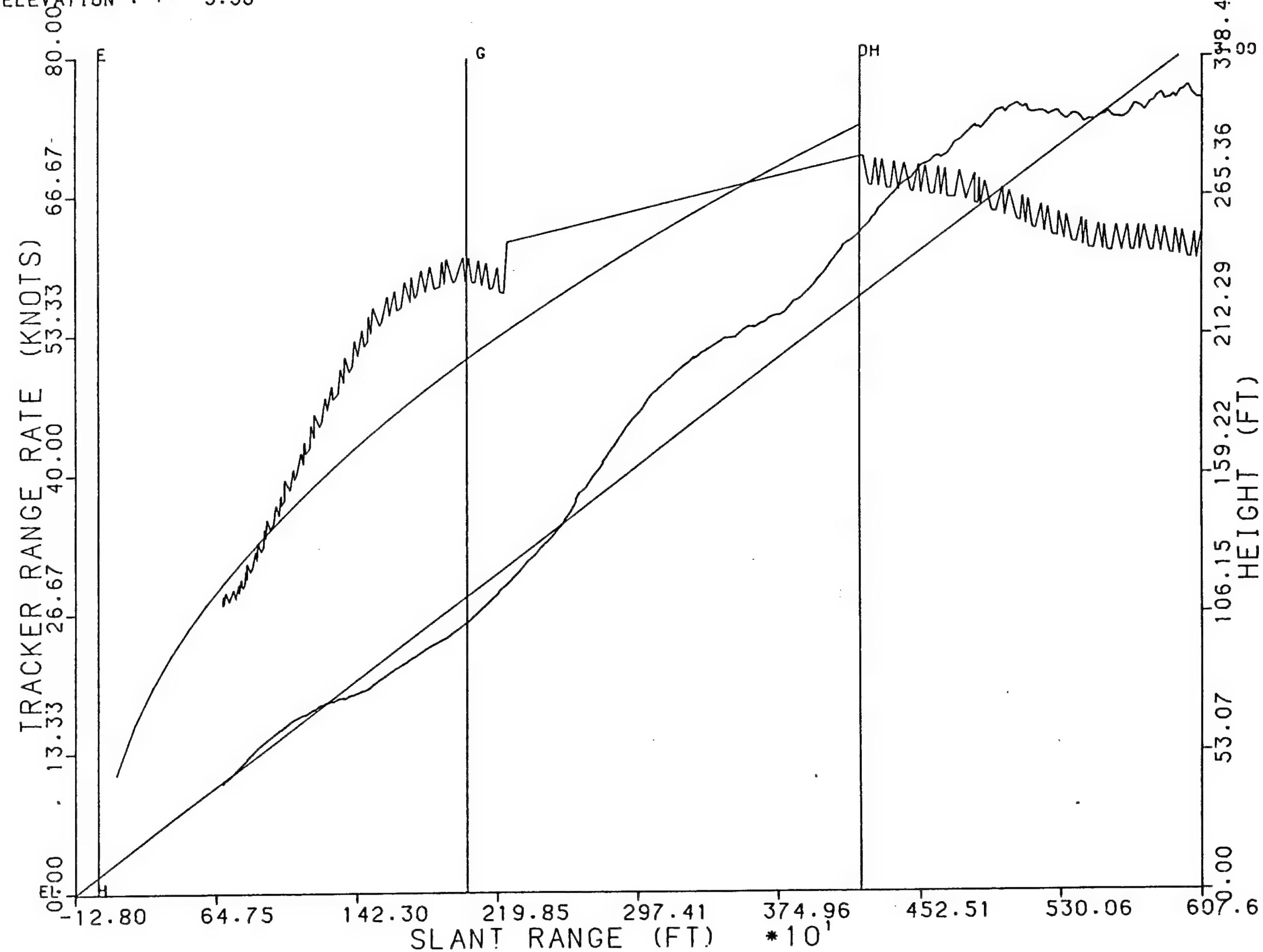


DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405
RUN # 1
5/11/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00
HEIGHT (FT)
0.00
53.07
106.15
159.22
212.29
265.36
318.44
TRACKER RANGE RATE (KNOTS)
0.00
13.33
26.67
40.00
53.33
66.67
80.00
SLANT RANGE (FT) *10¹
-12.80
12.80
64.75
142.30
219.85
297.41
374.96
452.51
530.06
607.61
E
G
DH
EL


RUN # 2
5/11/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 3.00
DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405
HEIGHT (FT)
0.00
53.07
106.15
159.22
212.29
265.36
318.44
TRACKER RANGE RATE (KNOTS)
0.00
13.33
26.67
40.00
53.33
66.67
80.00
SLANT RANGE (FT) *10[1]
-12.80
64.75
142.30
219.85
297.41
374.96
452.51
530.06
607.61
E
G
DH
H

RUN # 3
5/11/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 5 DEGREE R AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



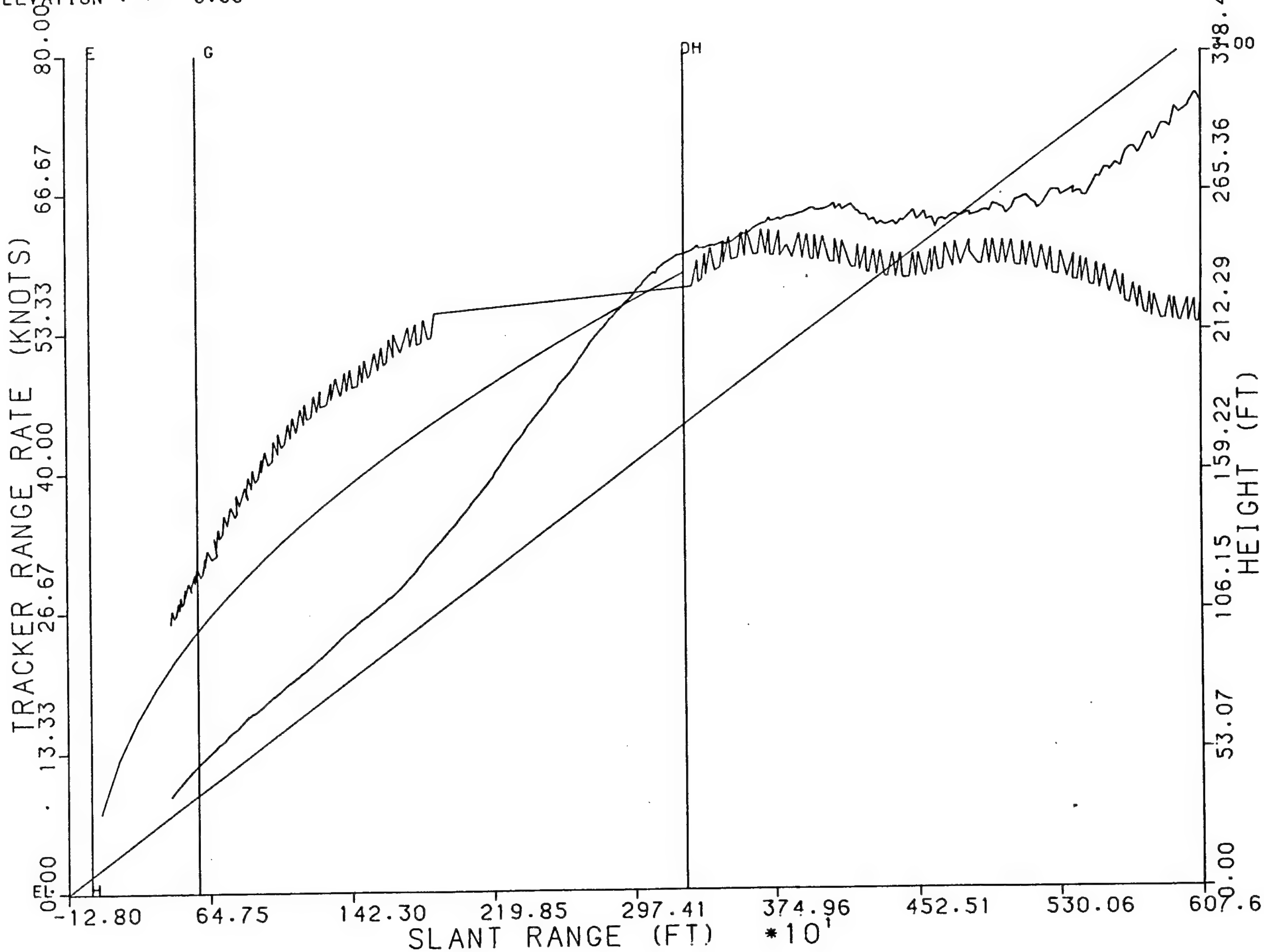
RUN # 4

5/11/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 5 DEGREE L AZ OFF

AZIMUTH : +- 0.00

ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



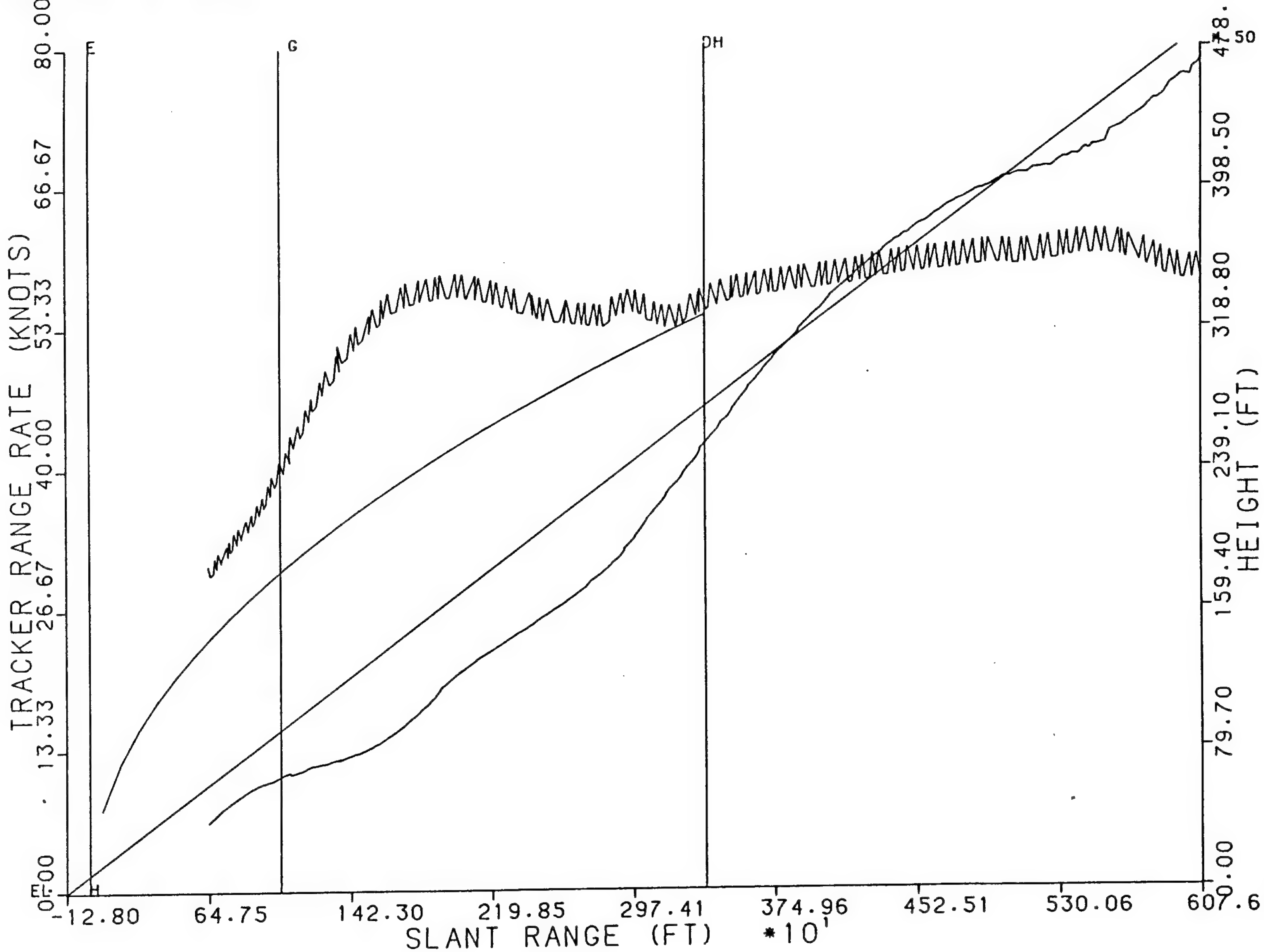
RUN # 5

5/11/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 0 DEGREE AZ ON

AZIMUTH : +- 0.00

ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



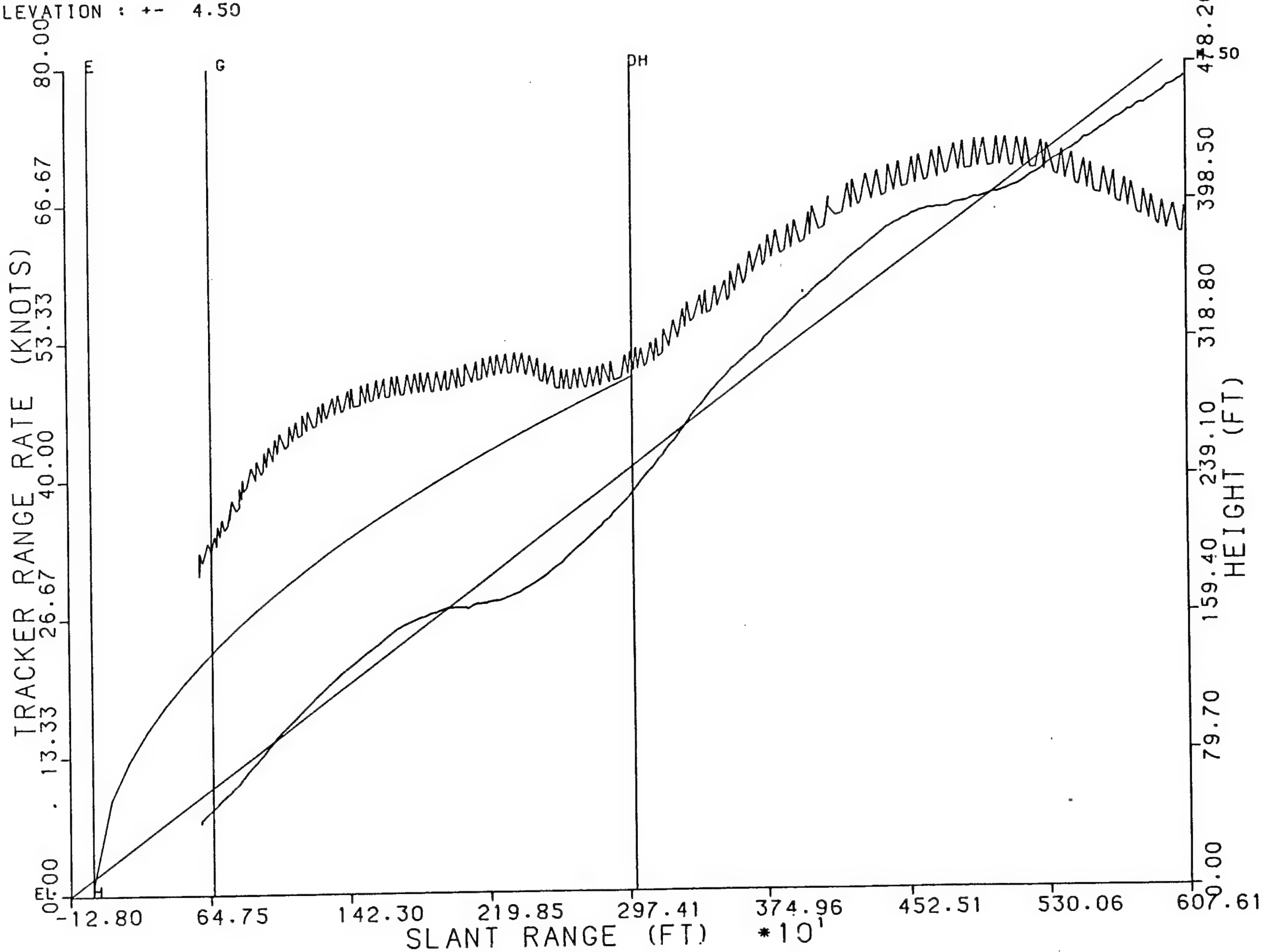
RUN # 6

5/11/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE R AZ OFF

AZIMUTH : +- 0.00

ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



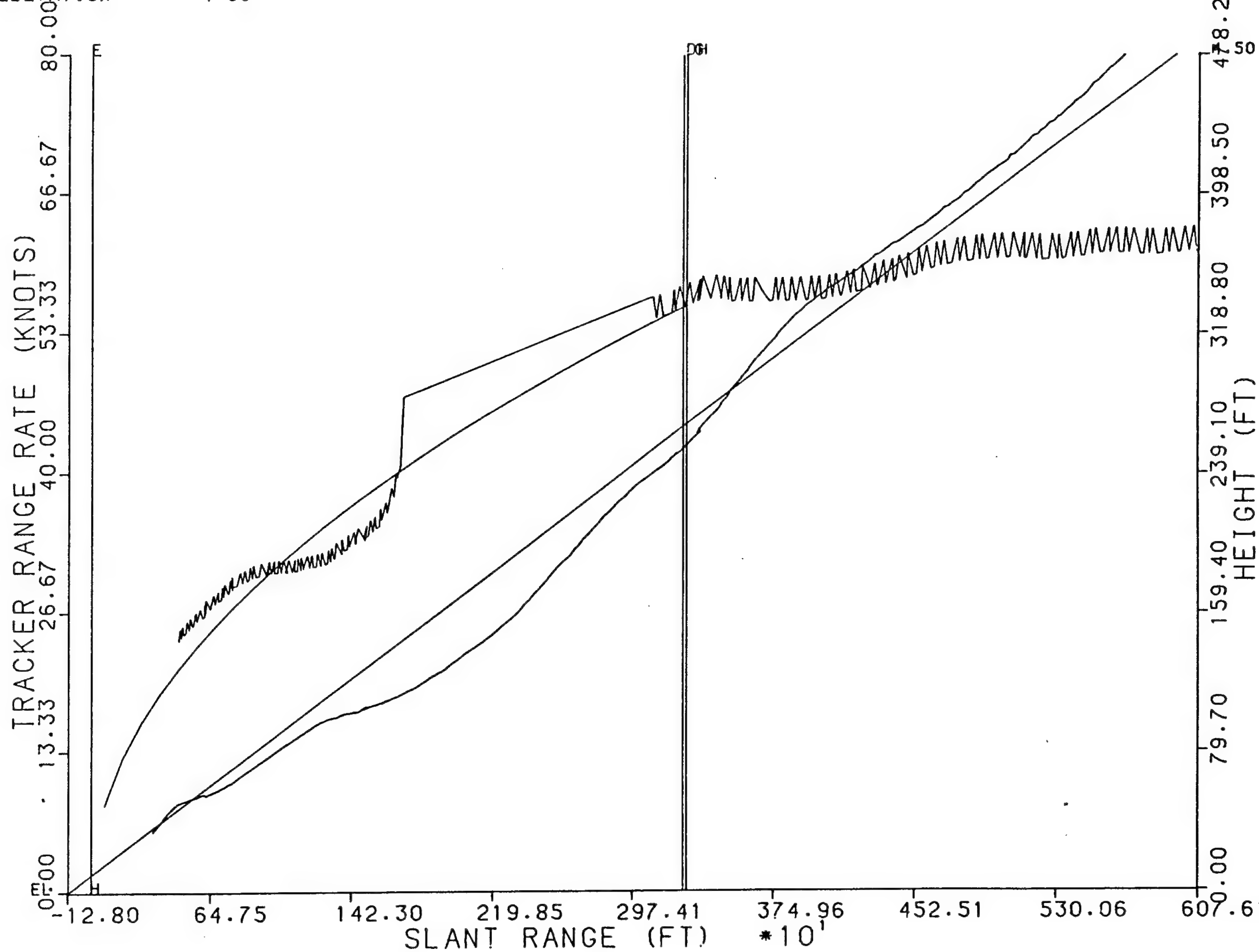
RUN # 7

5/11/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE L AZ ON

AZIMUTH : +- 0.00

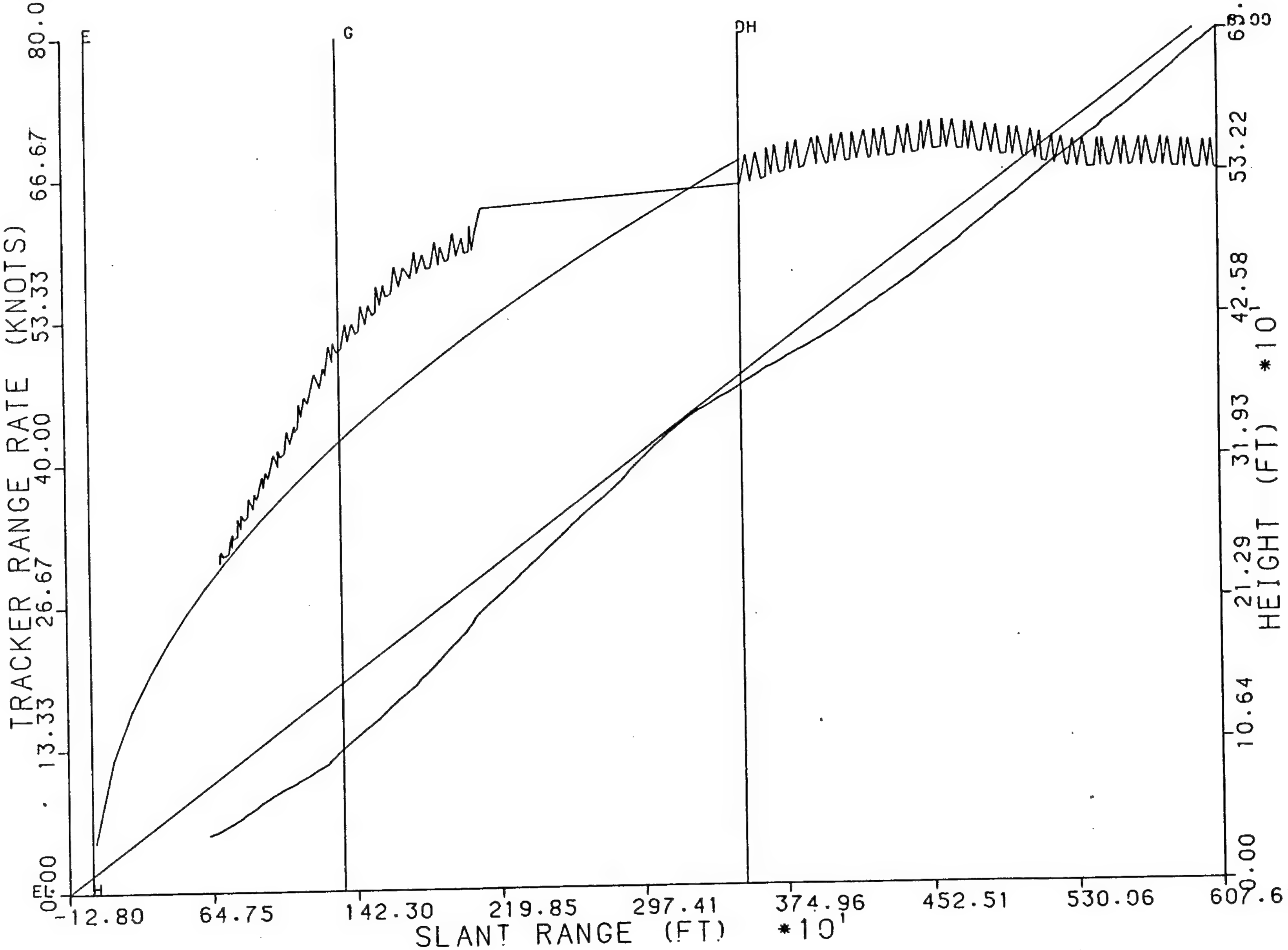
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 8
5/11/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



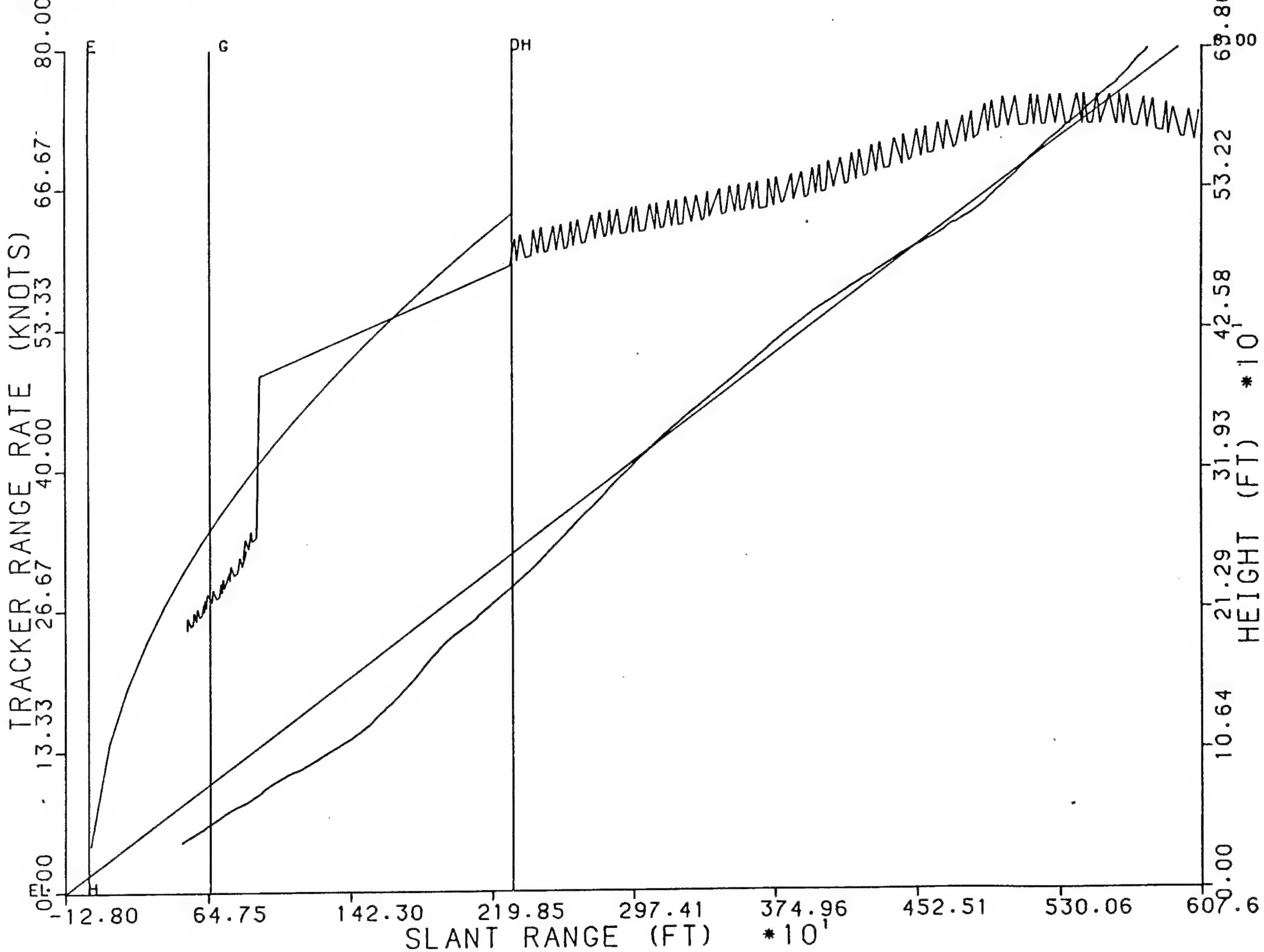
RUN # 9

5/11/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 5 DEGREE R AZ ON

AZIMUTH : +- 0.00

ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



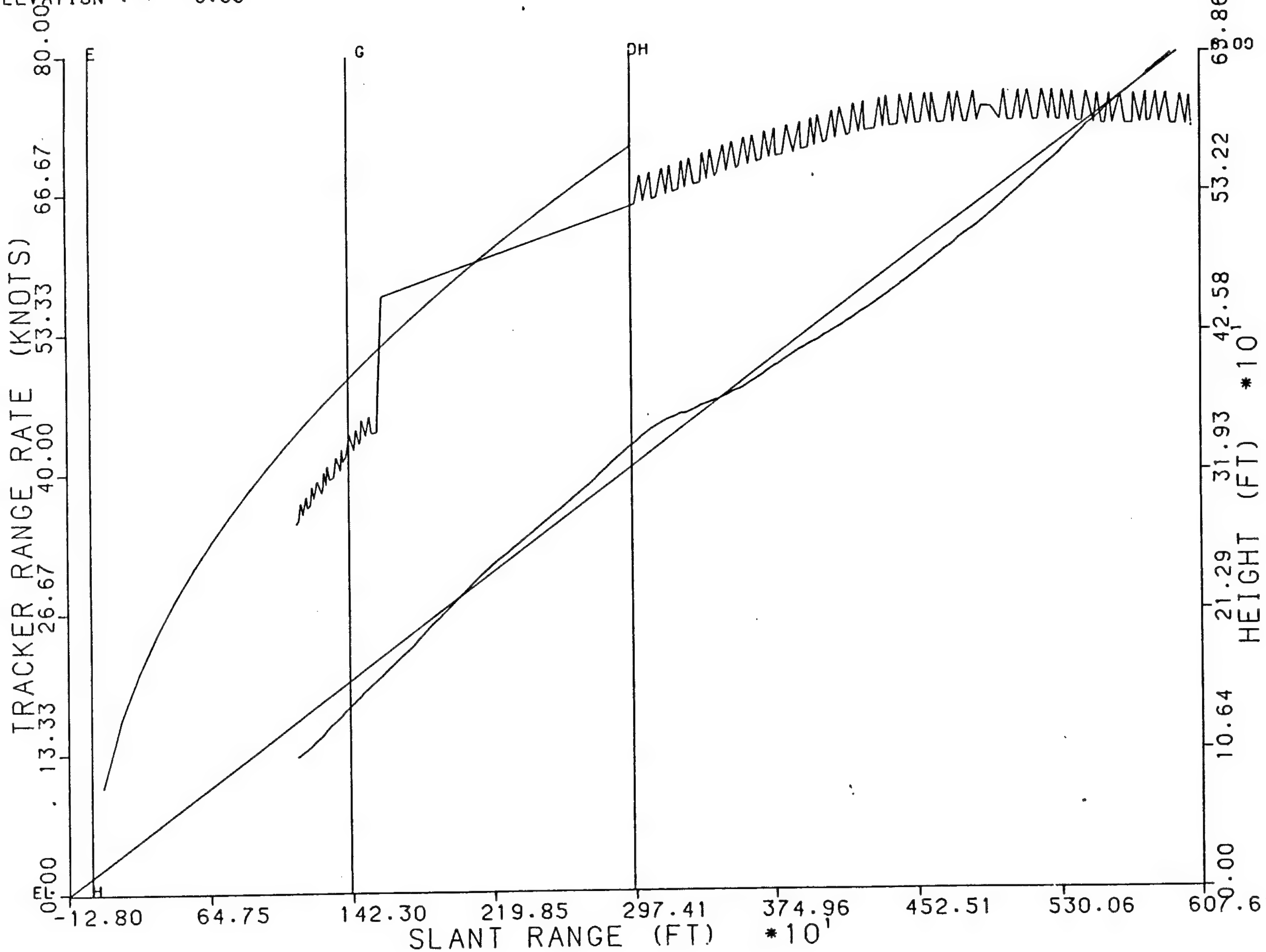
RUN # 10

5/11/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 5 DEGREE L AZ OFF

AZIMUTH : +- 0.00

ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 1

5/25/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ ON

AZIMUTH : +- 0.00

ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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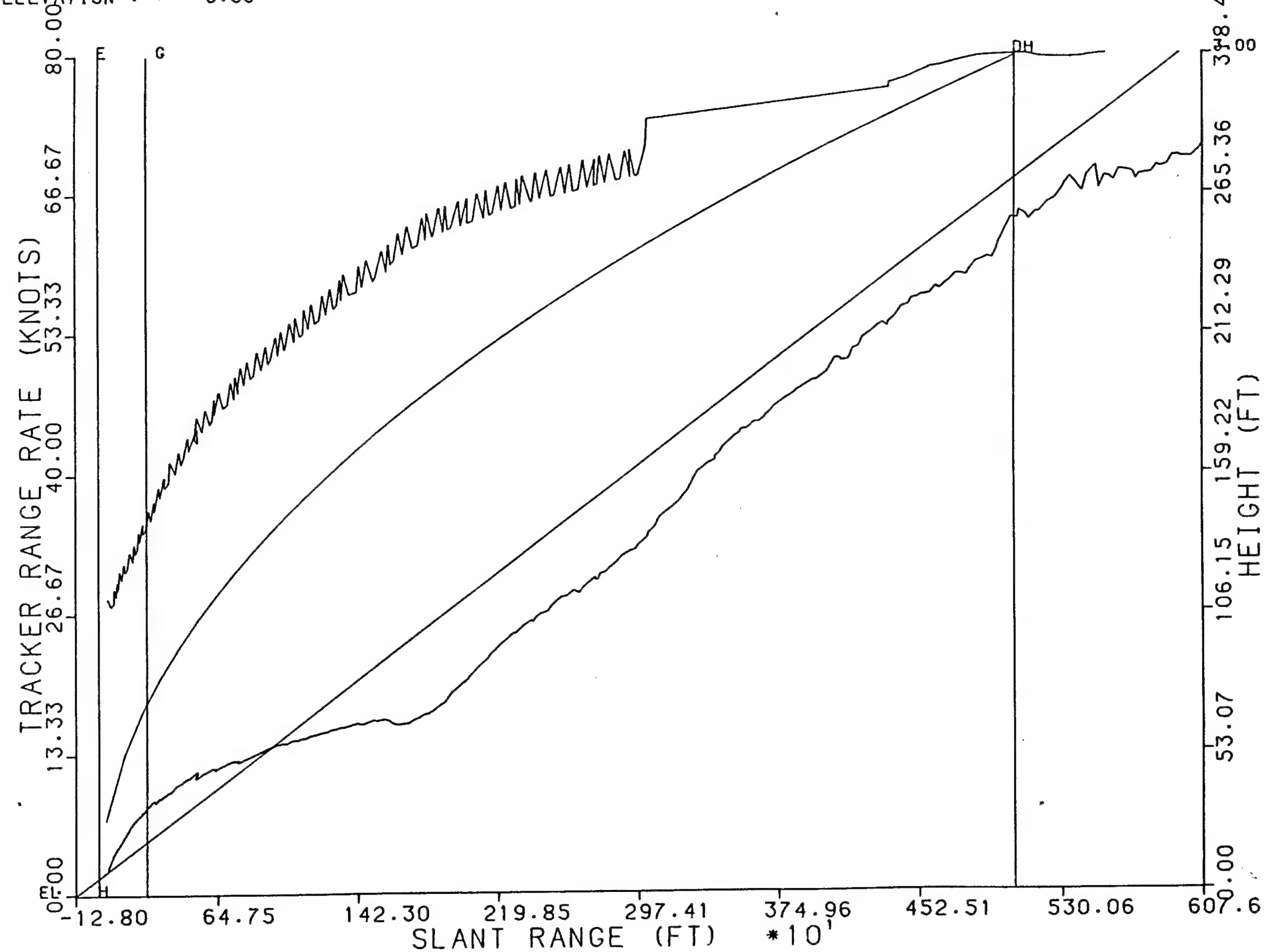

RUN # 2
5/25/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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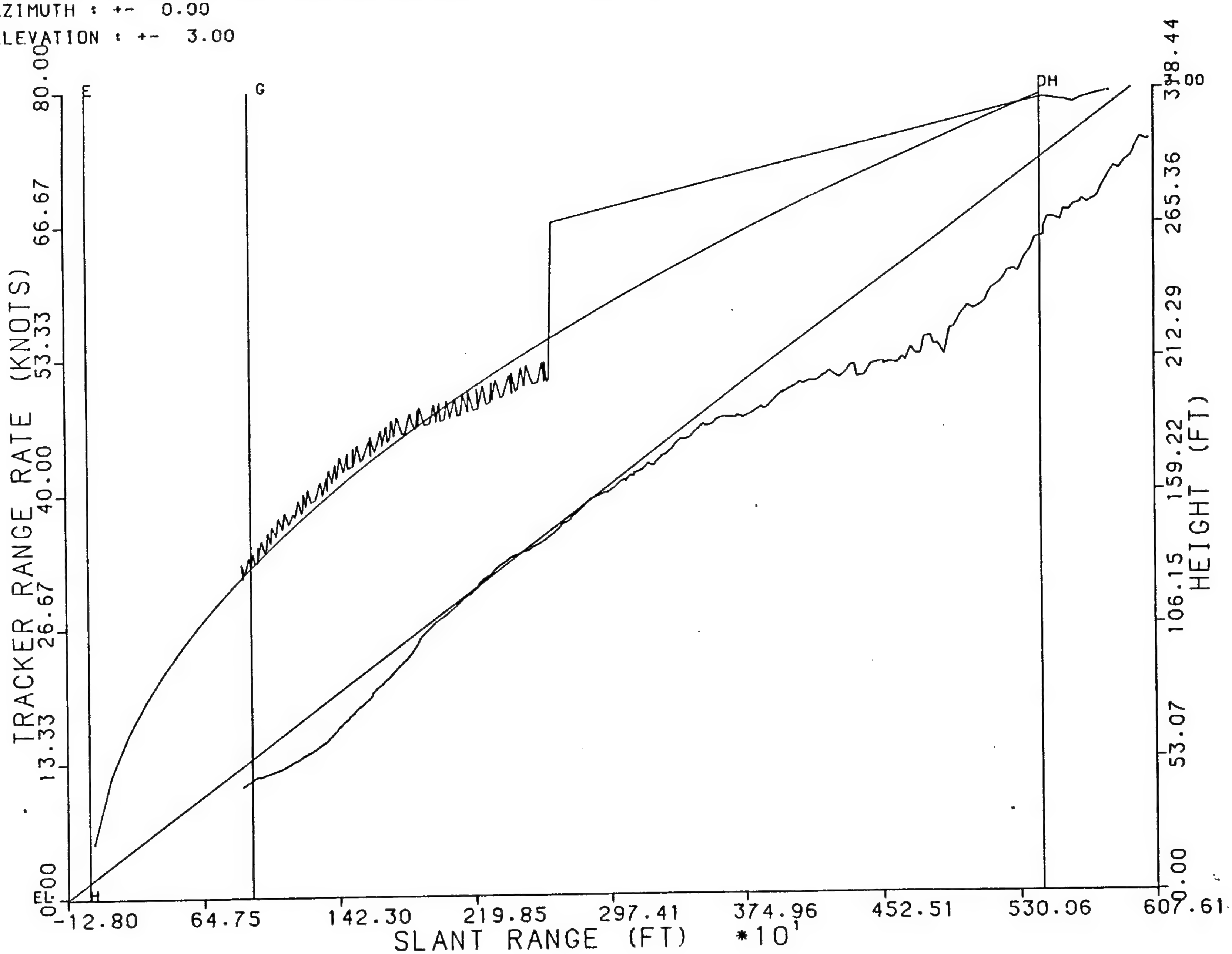
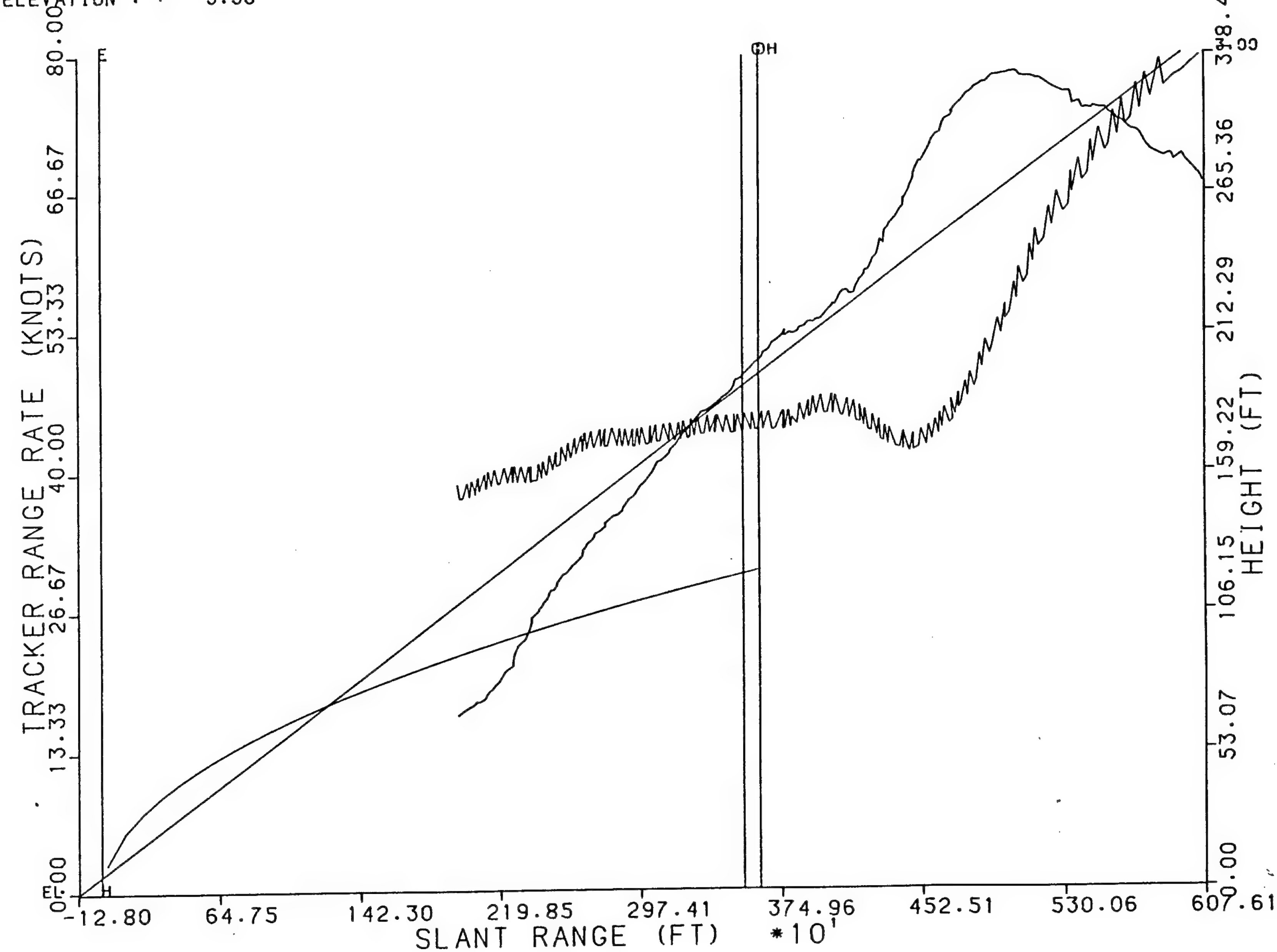


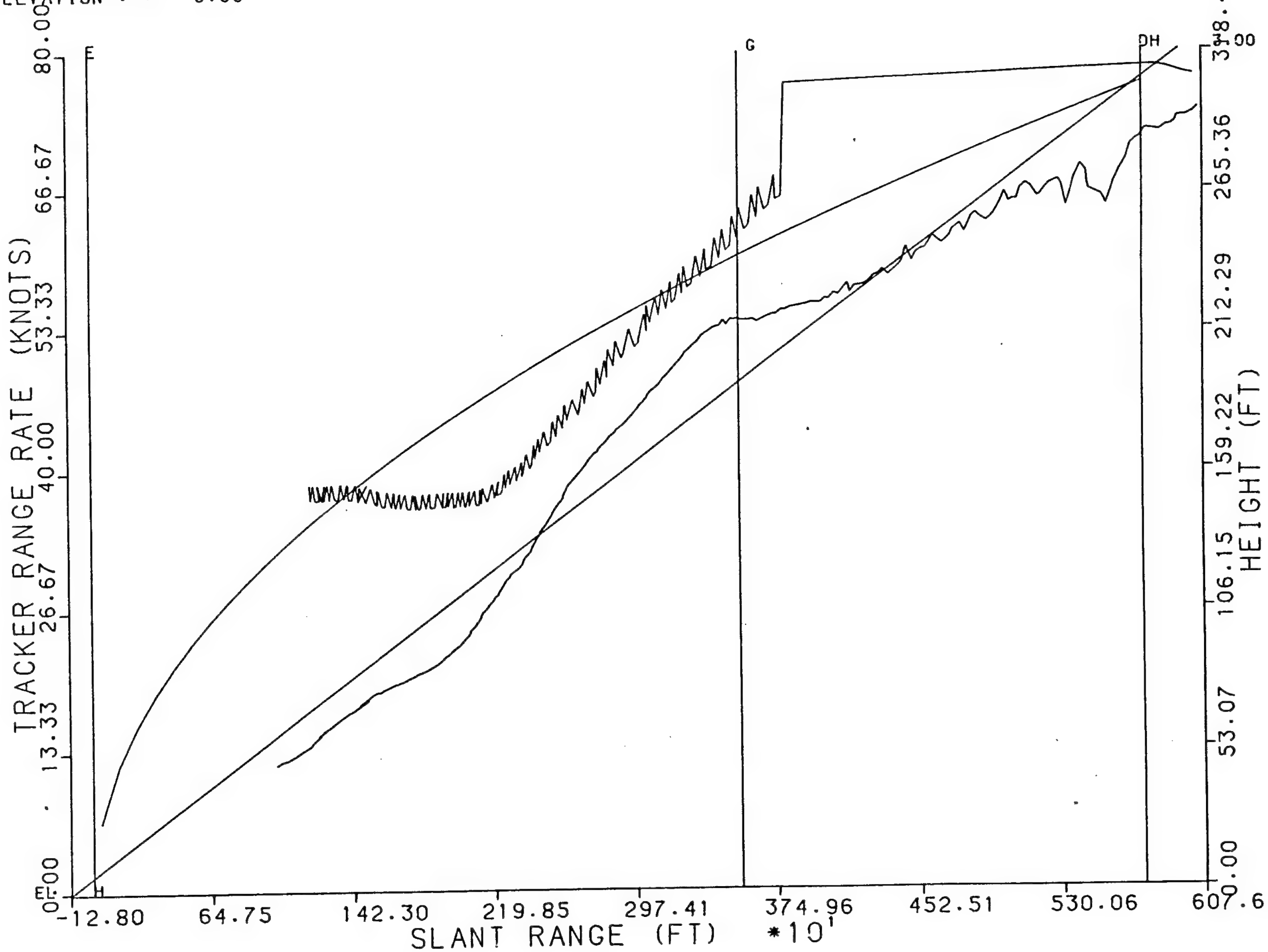
RUN # 3
5/25/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 5 DEGREE R AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 4
5/25/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 5 DEGREE L AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



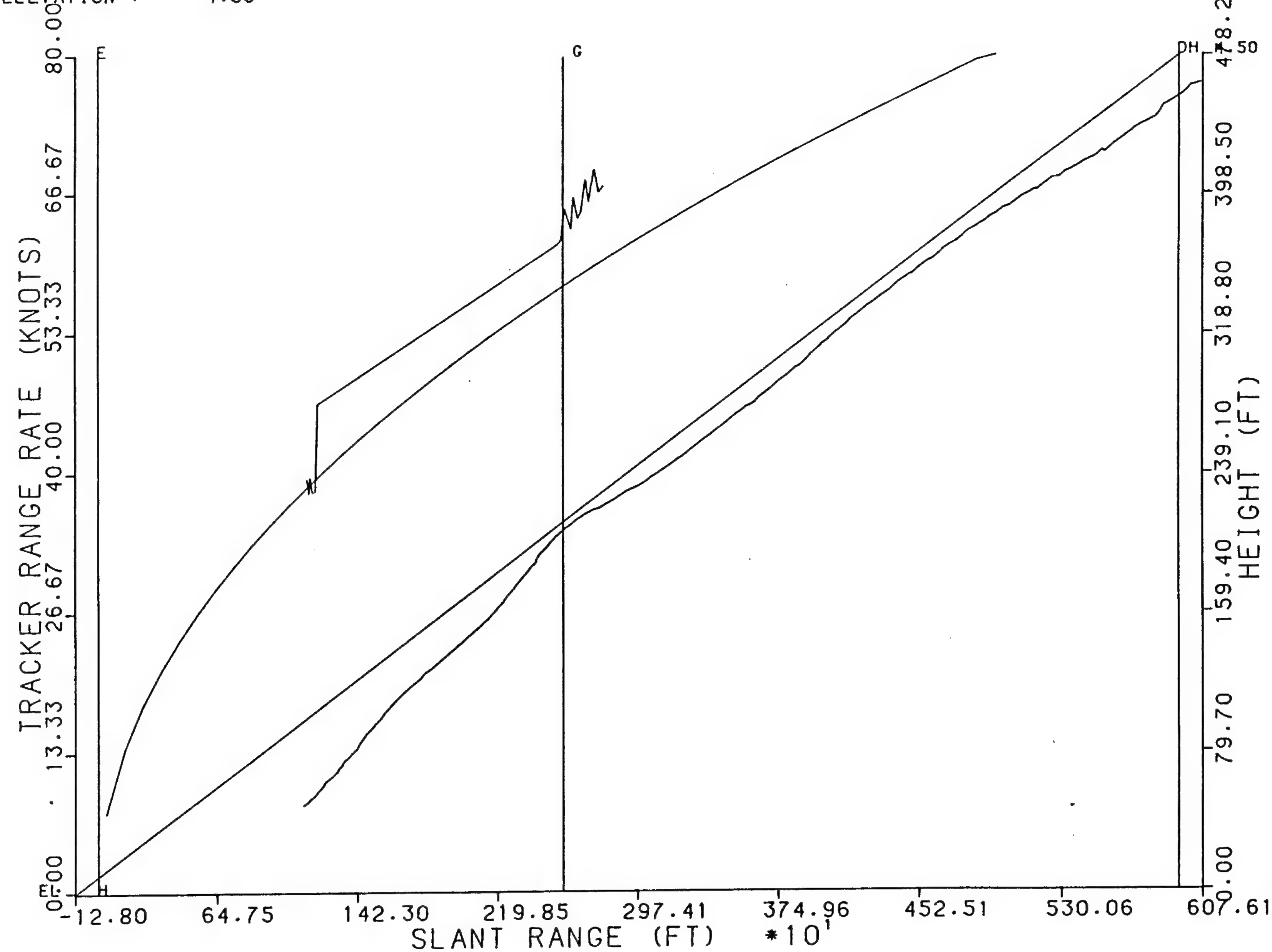
RUN # 5

5/25/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 0 DEGREE AZ ON

AZIMUTH : +- 0.00

ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 6

5/25/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE R AZ OFF

AZIMUTH : +- 0.00

ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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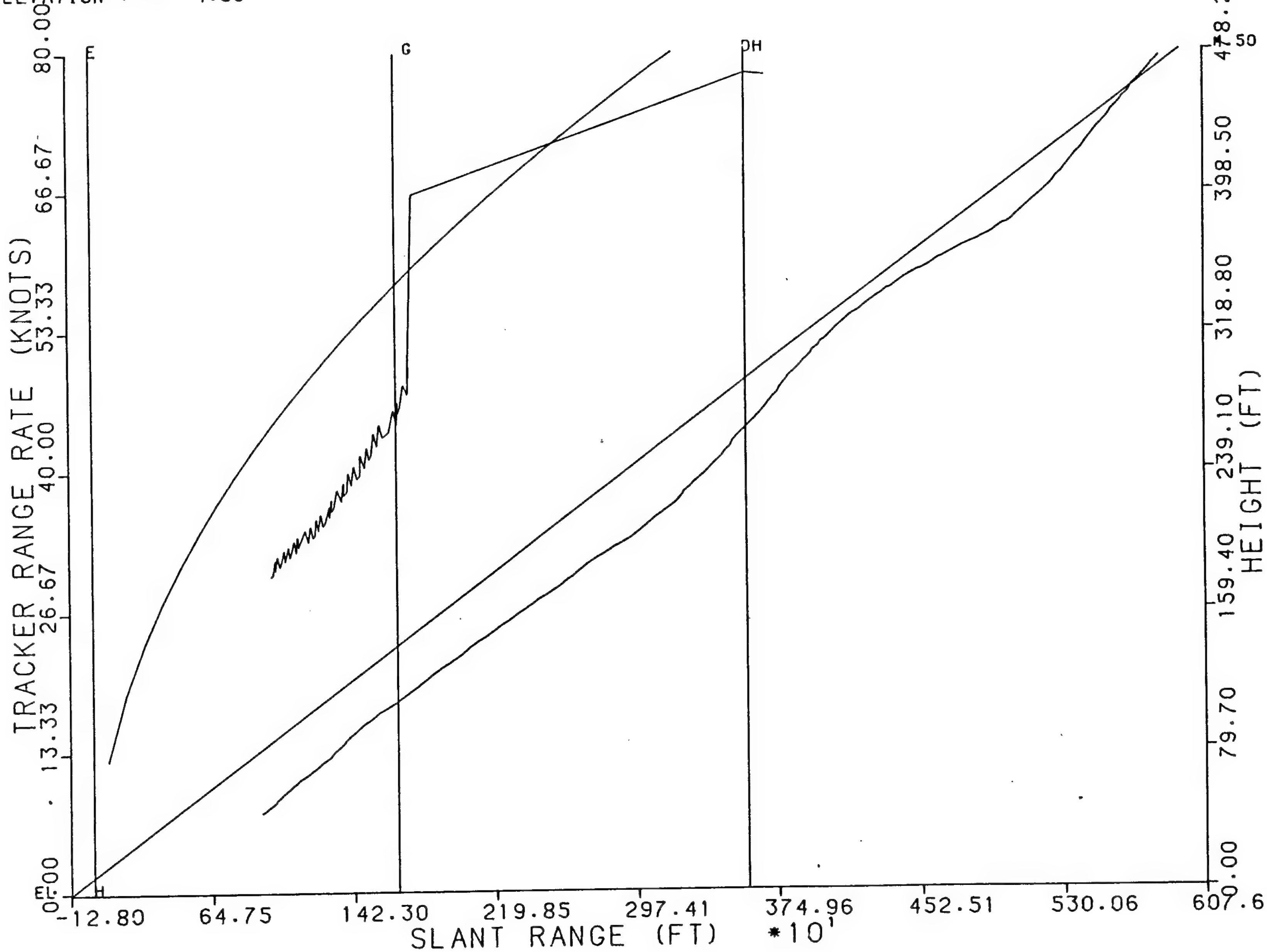
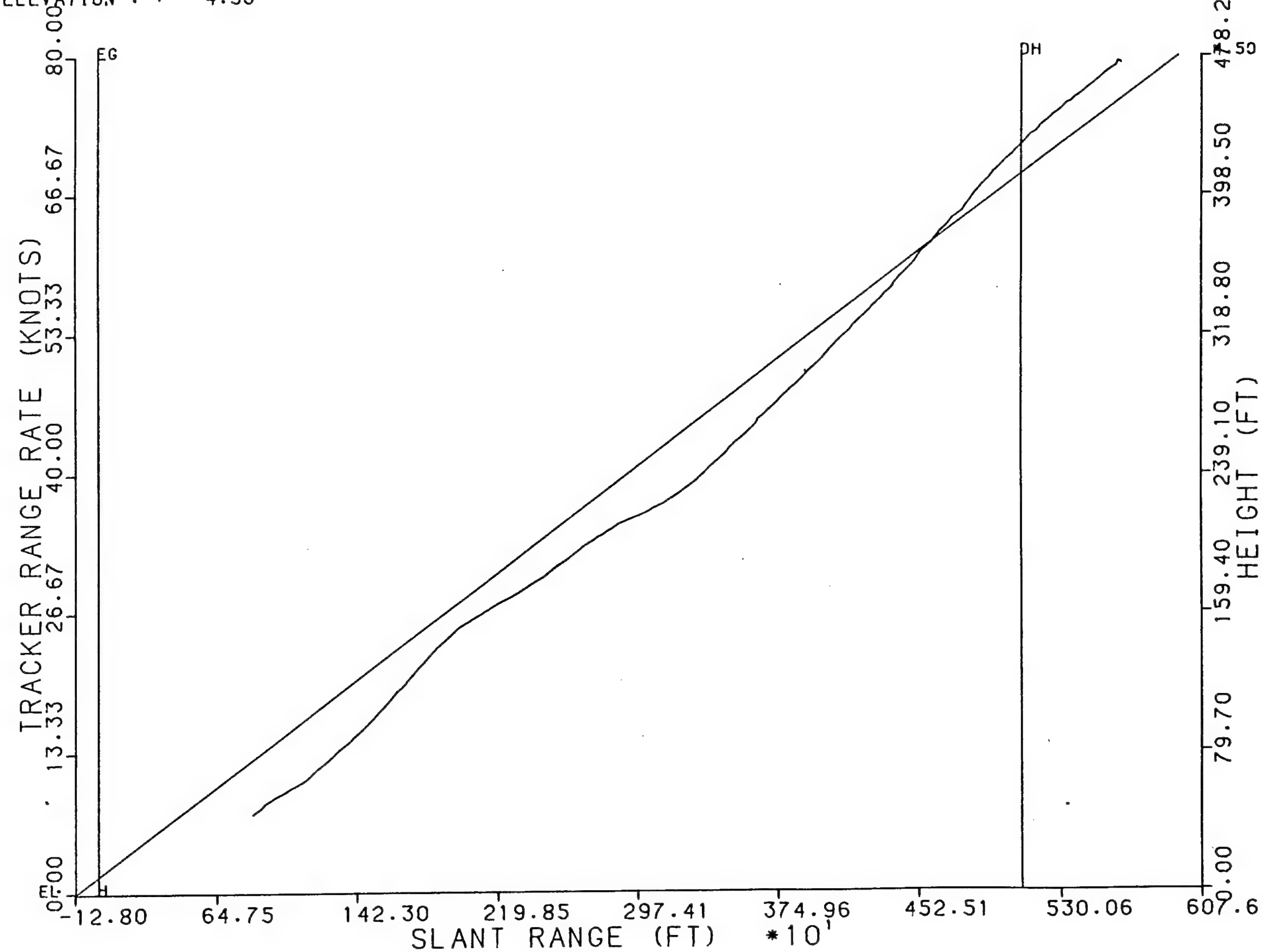


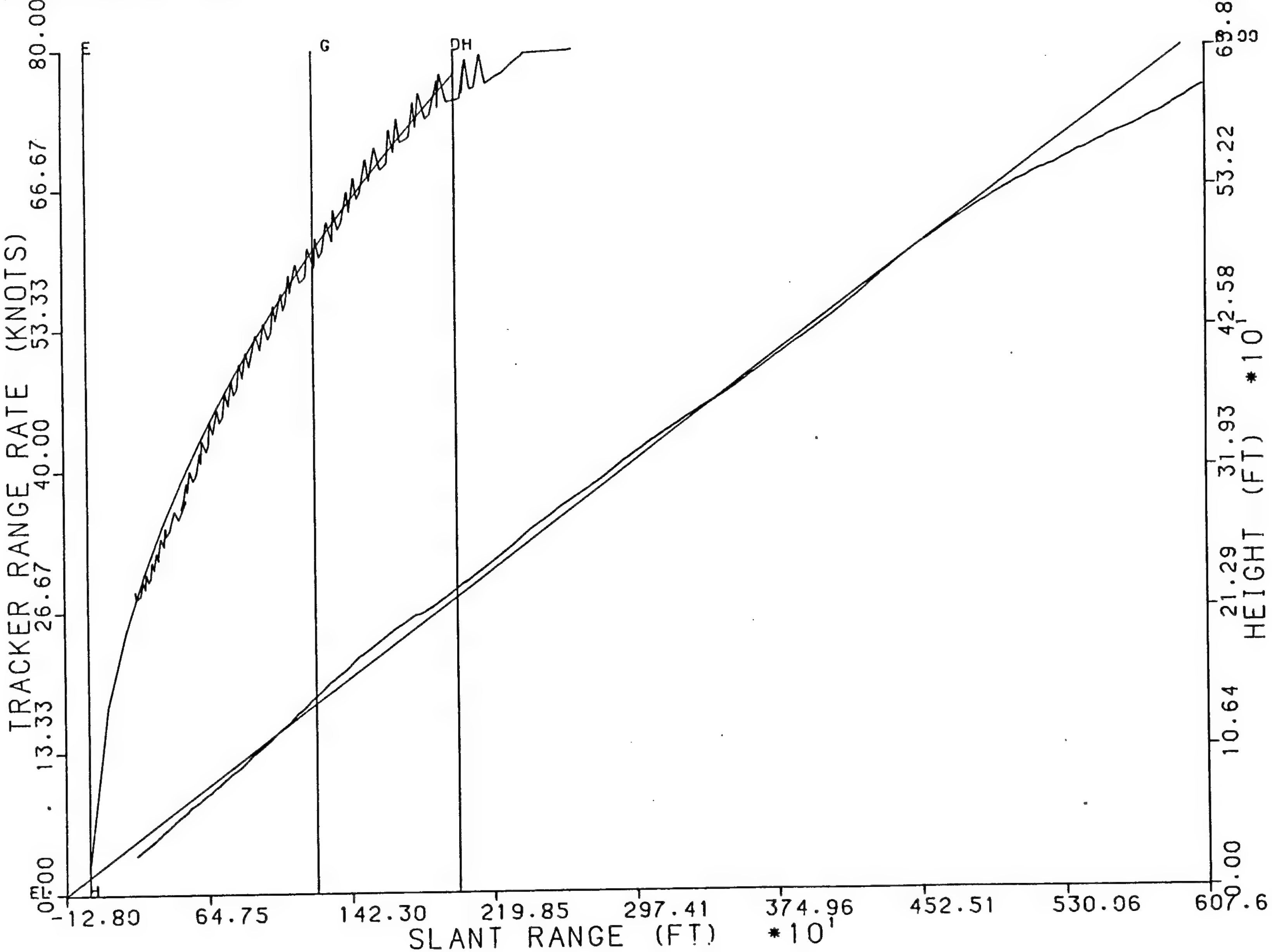
RUN # 7
5/25/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE L AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT. N J 08405



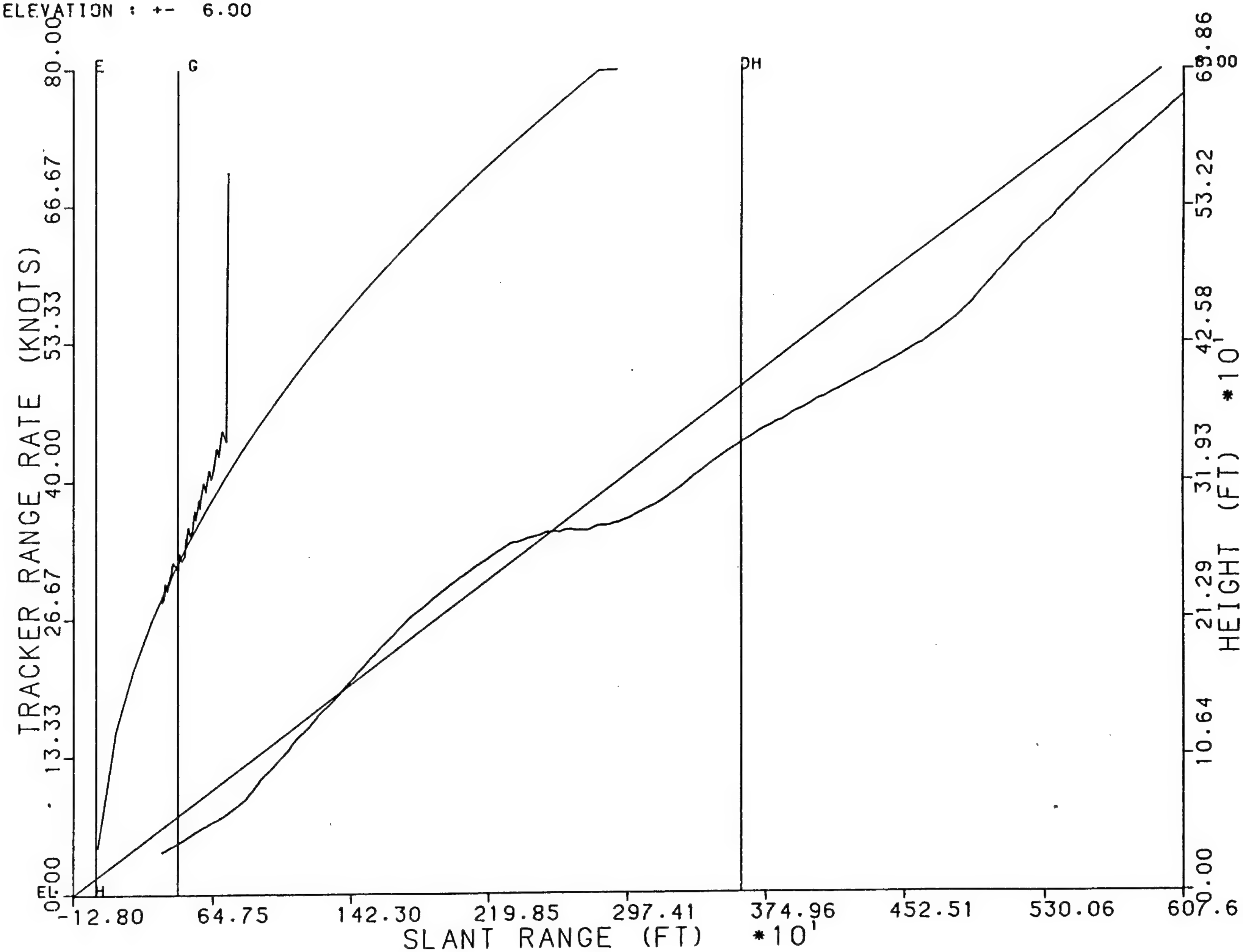
RUN # 8
5/25/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



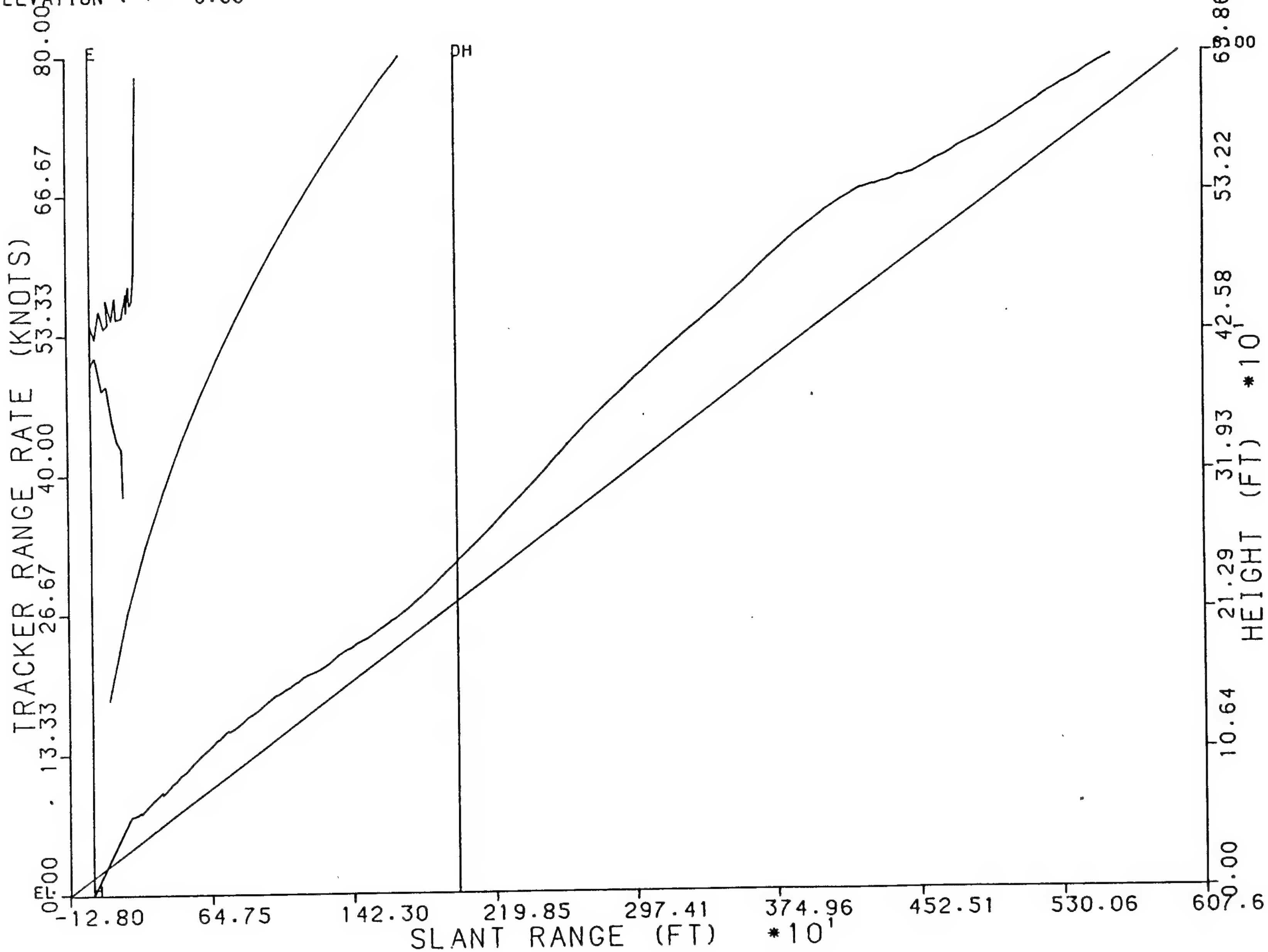
RUN # 9
5/25/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 5 DEGREE R AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



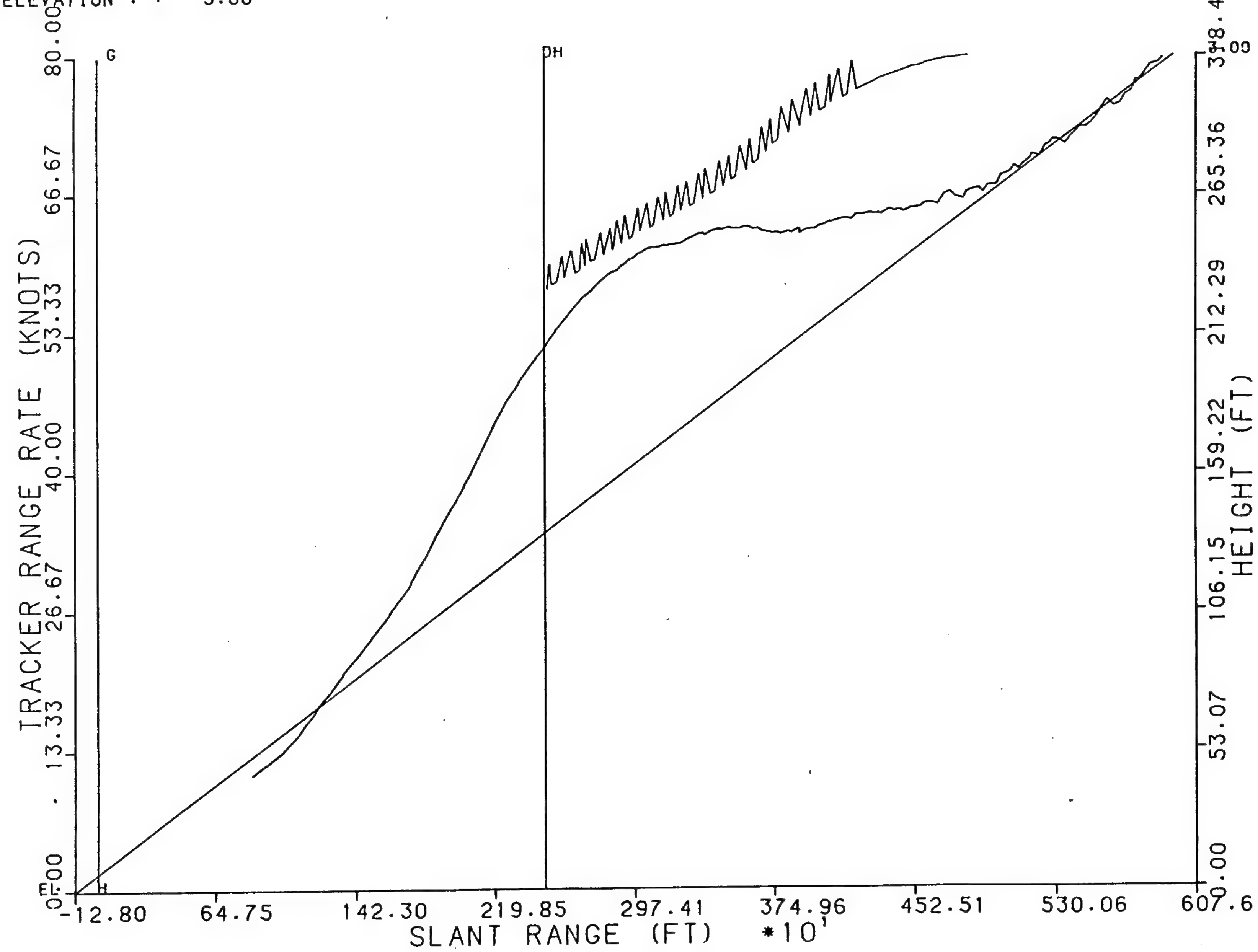
RUN # 10
5/25/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 5 DEGREE L AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT. N J 08405



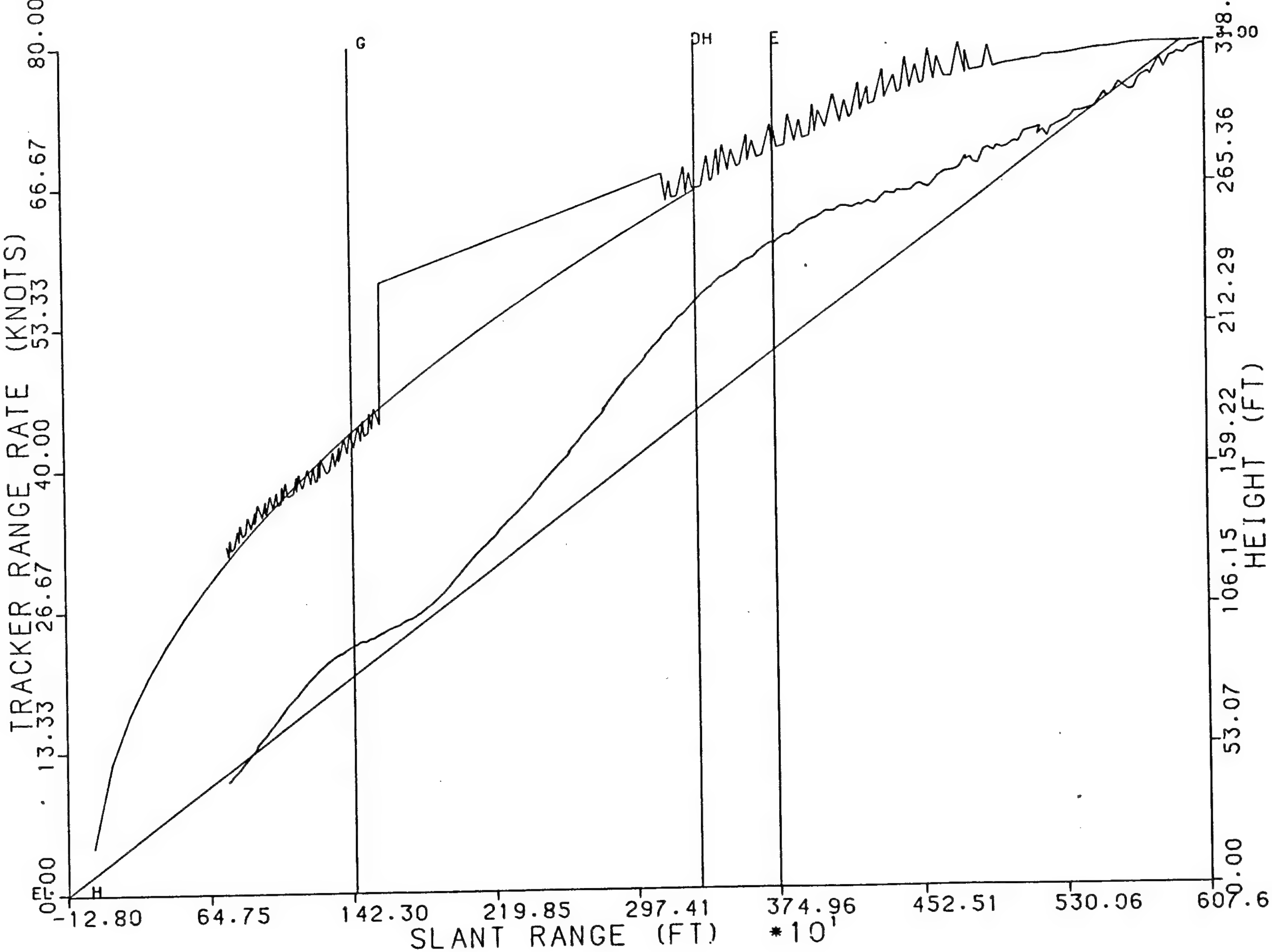
RUN # 1
5/26/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT. N J 08405



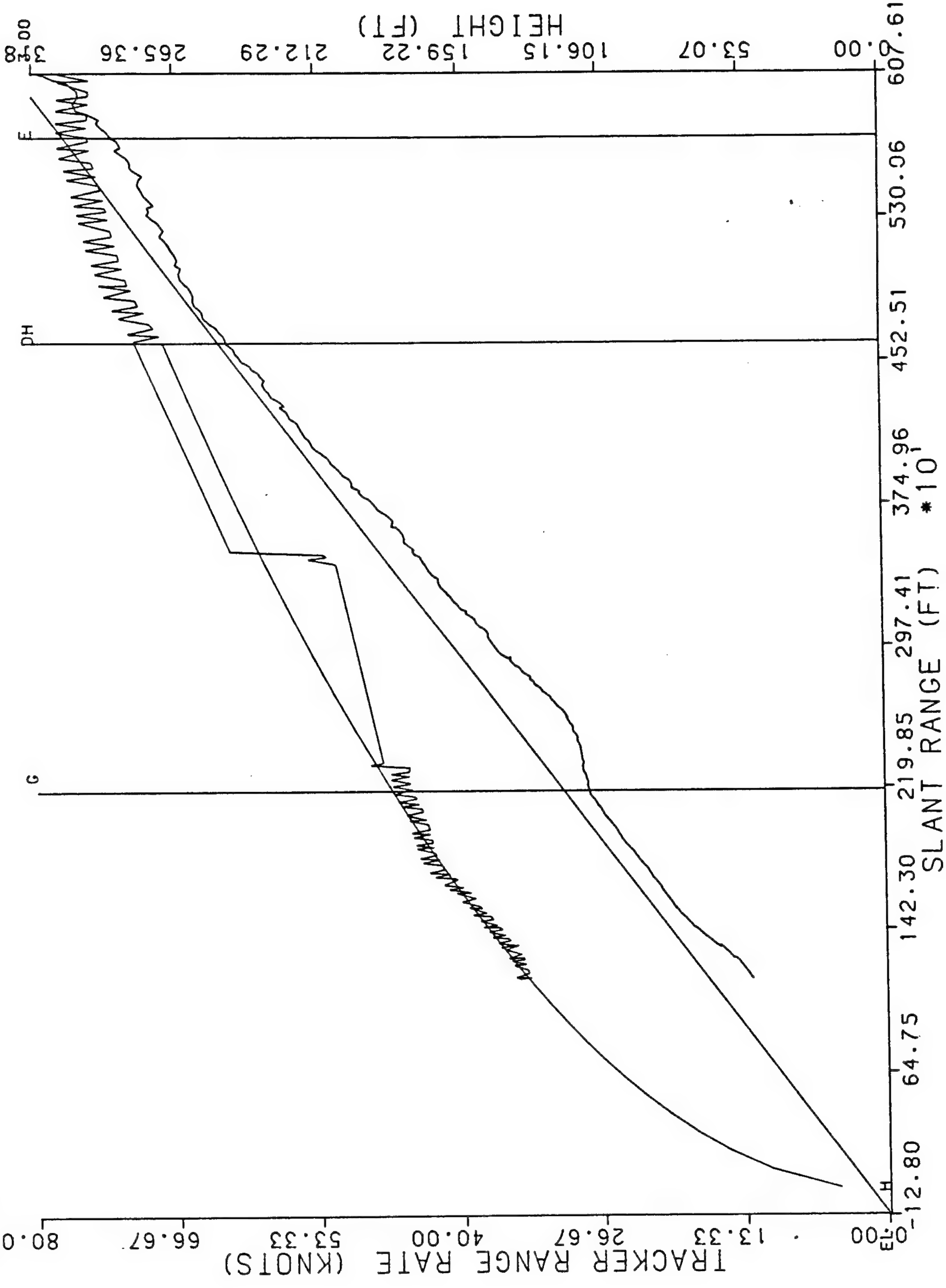
RUN # 2
5/26/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 3
5/26/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 5 DEGREE R AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



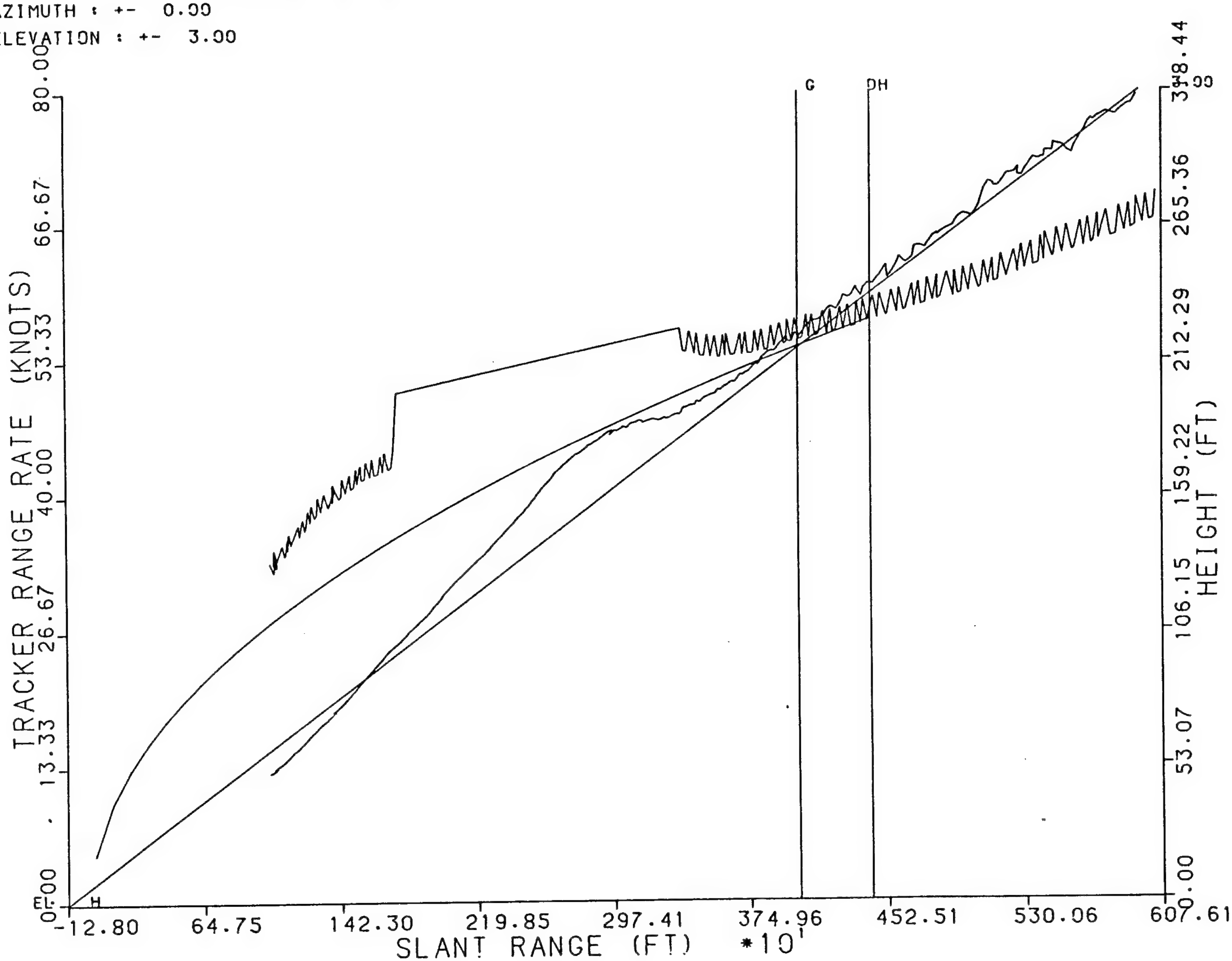
RUN # 4

5/26/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 5 DEGREE L AZ OFF

AZIMUTH : +- 0.00

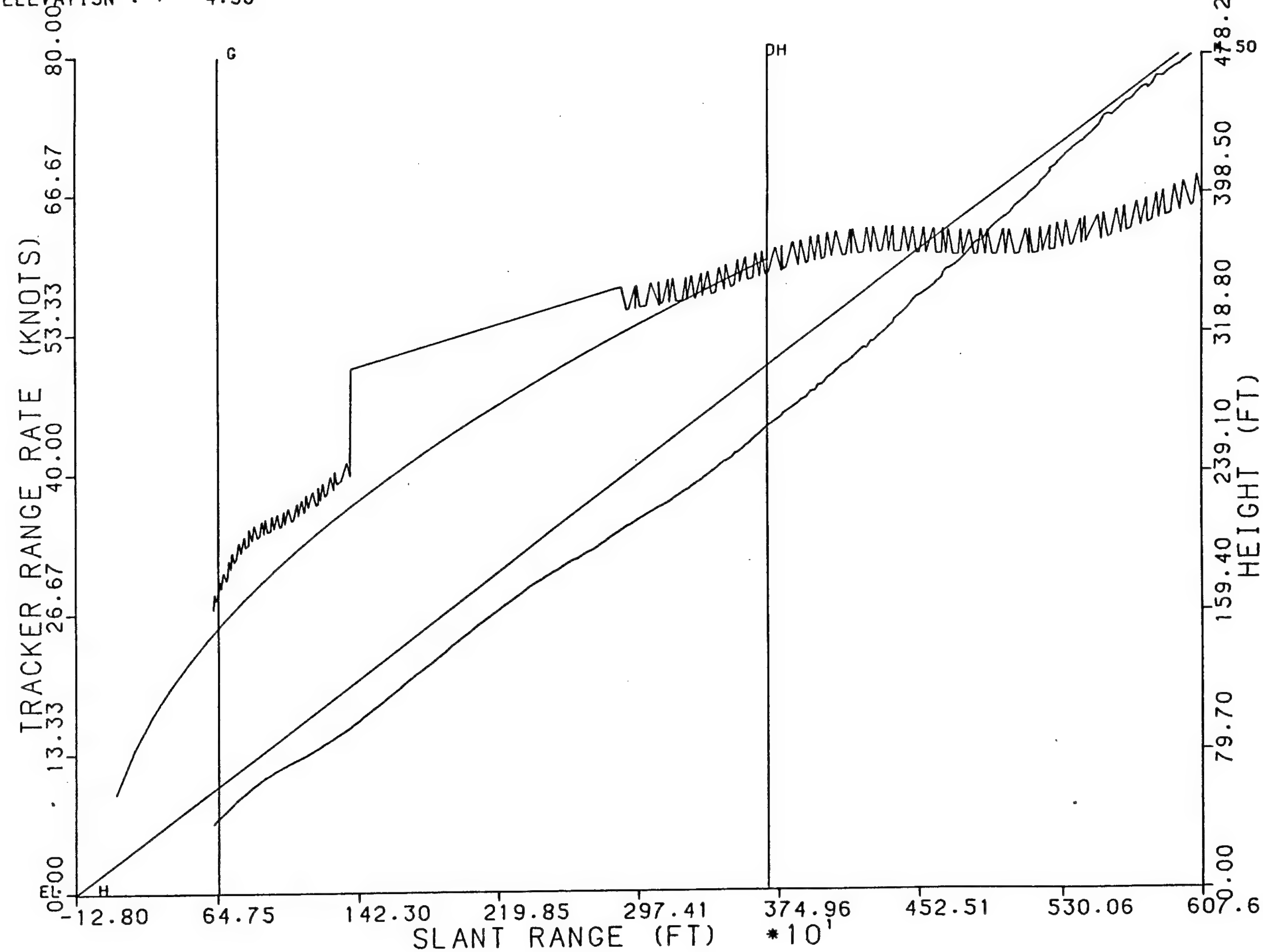
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT. N J 08405



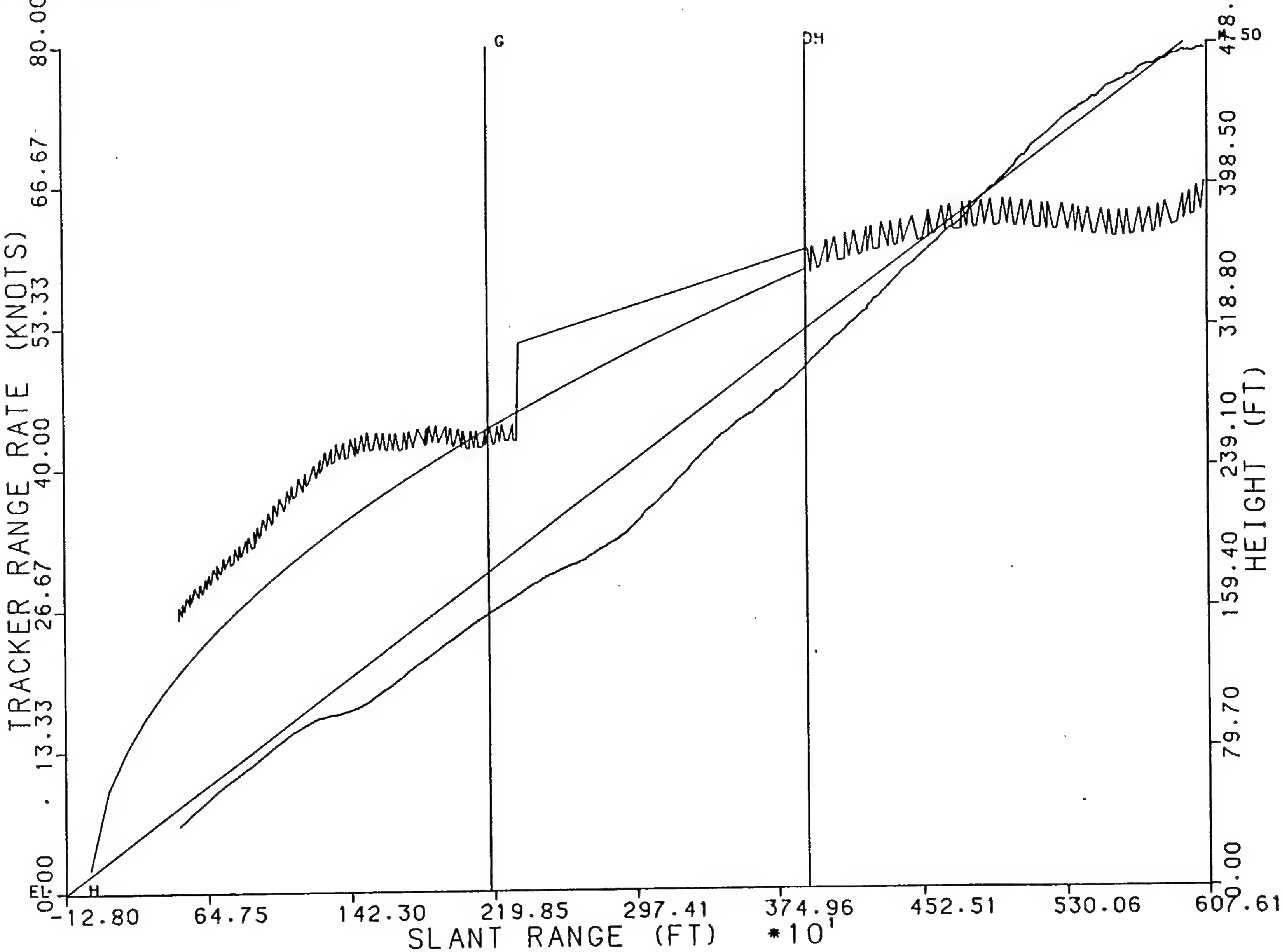
RUN # 5
5/26/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 6
5/26/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE R AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT. N J 08405



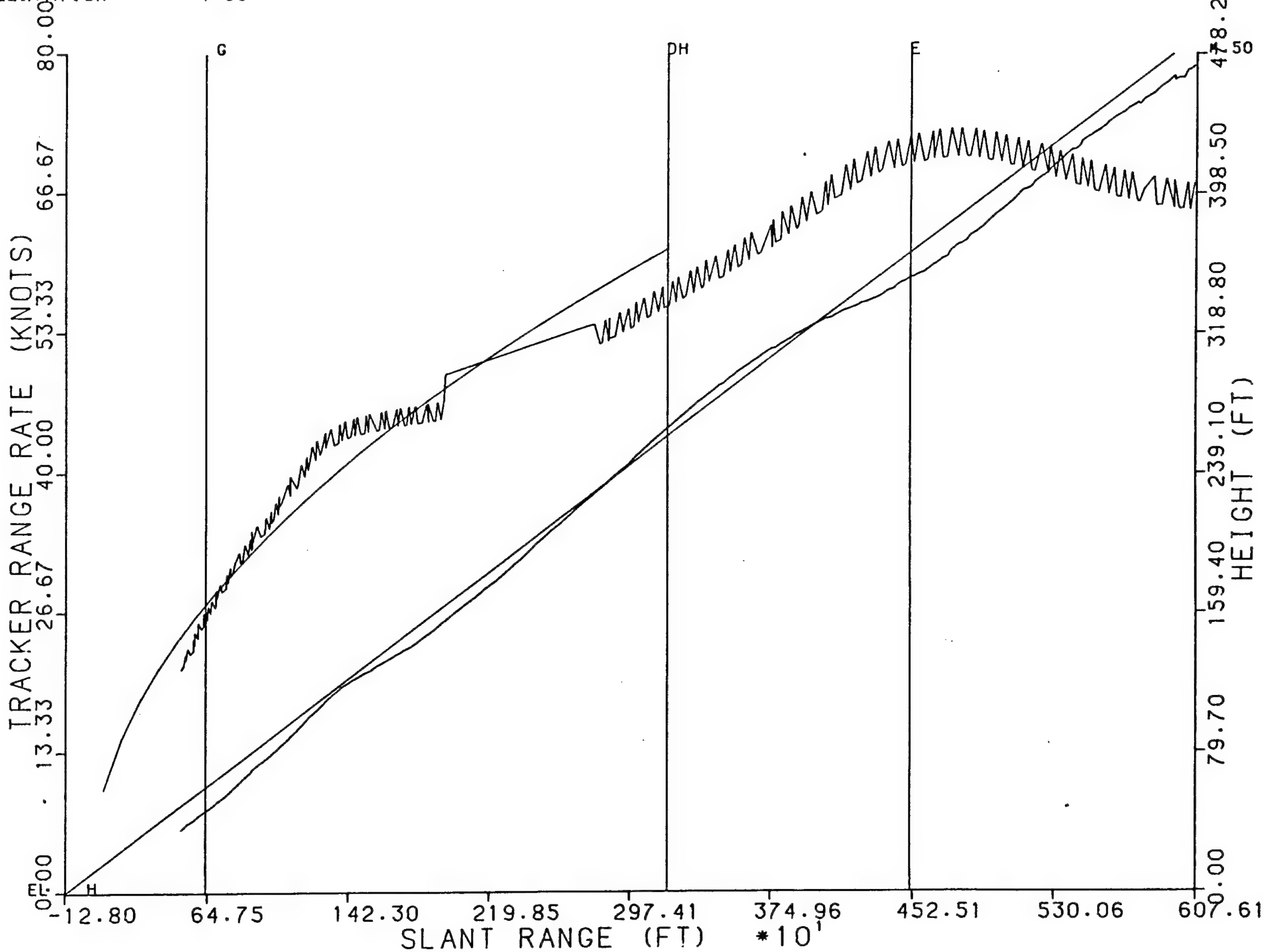
RUN # 7

5/26/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE L AZ ON

AZIMUTH : +- 0.00

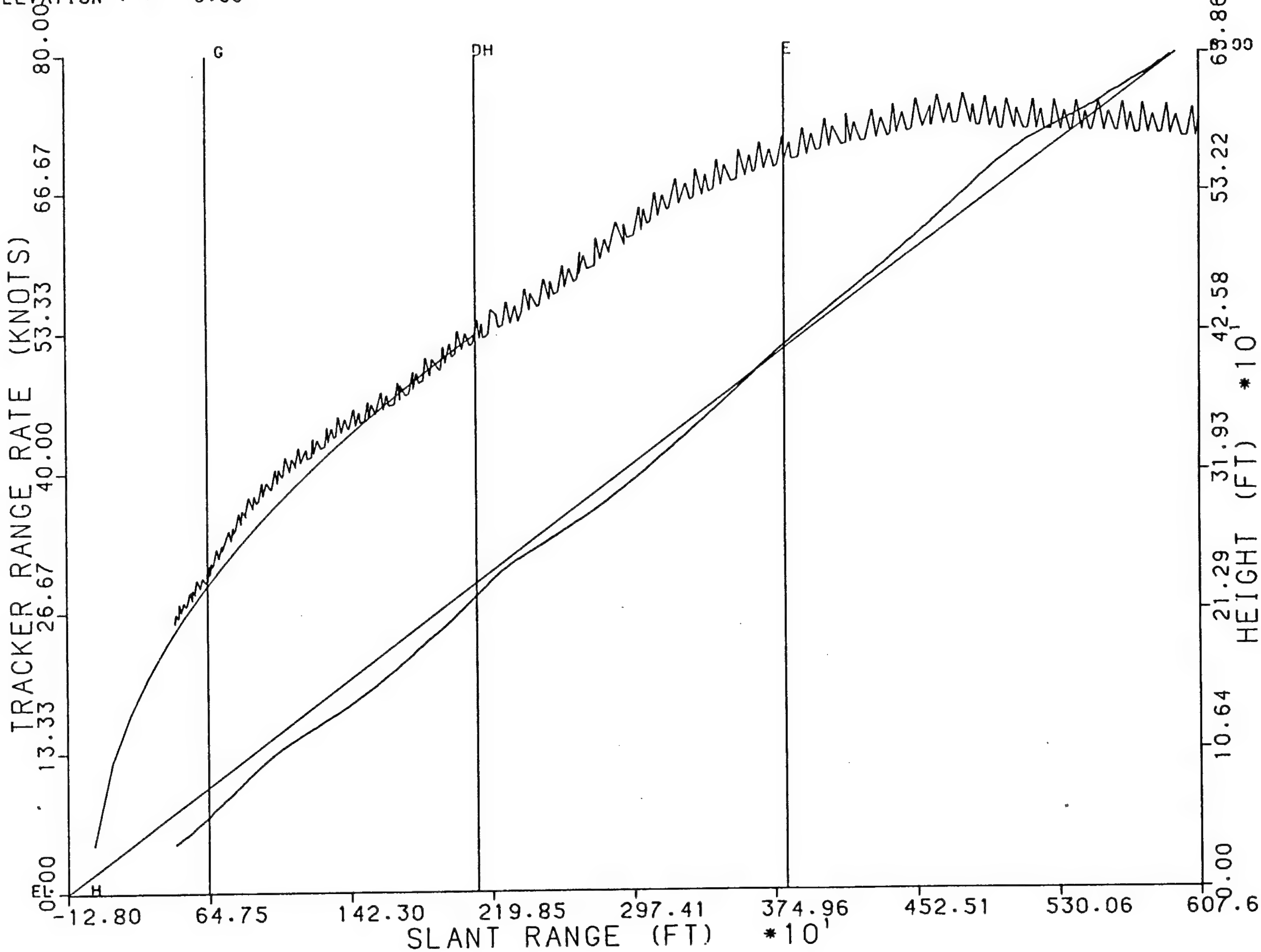
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 8
5/26/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



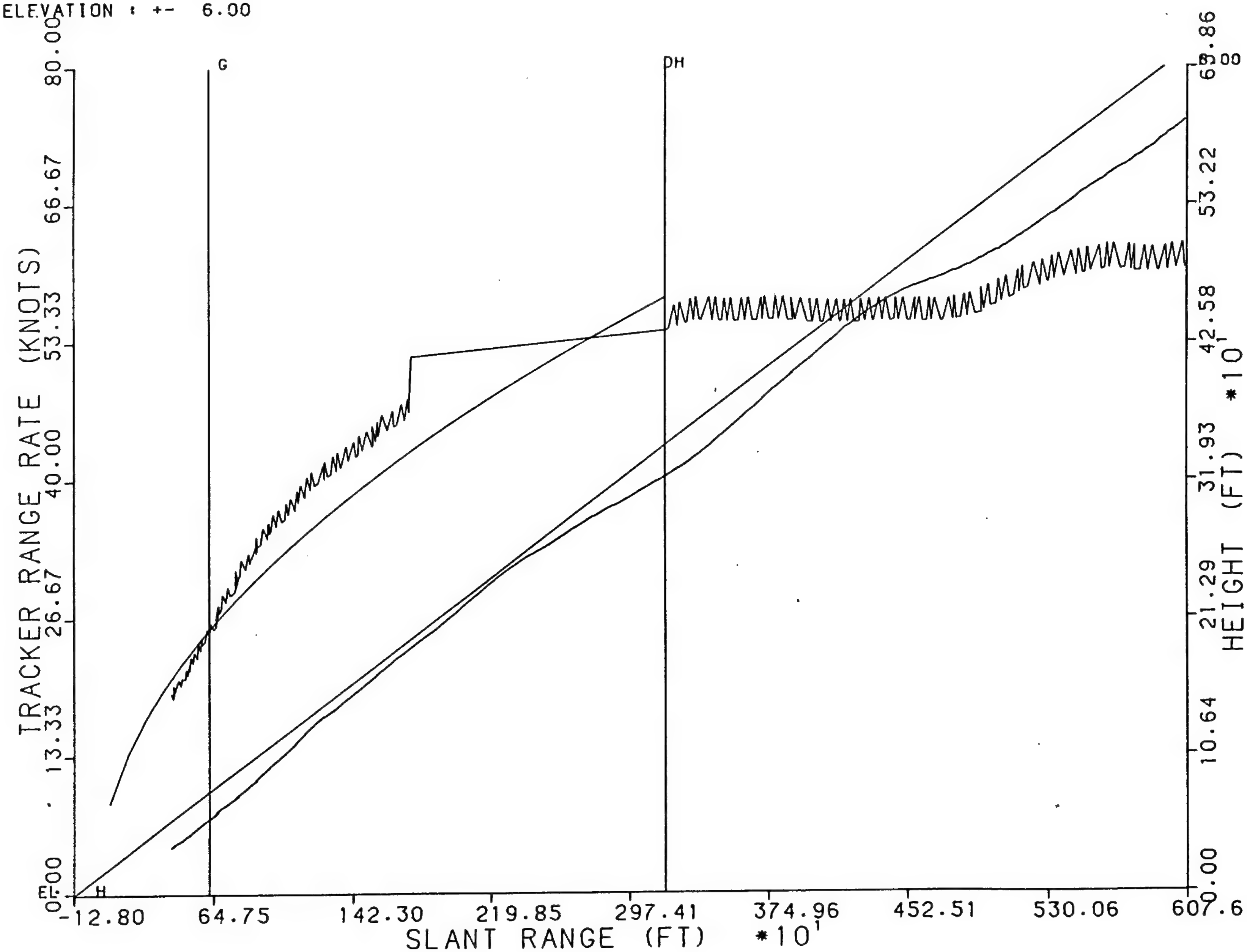
RUN # 9

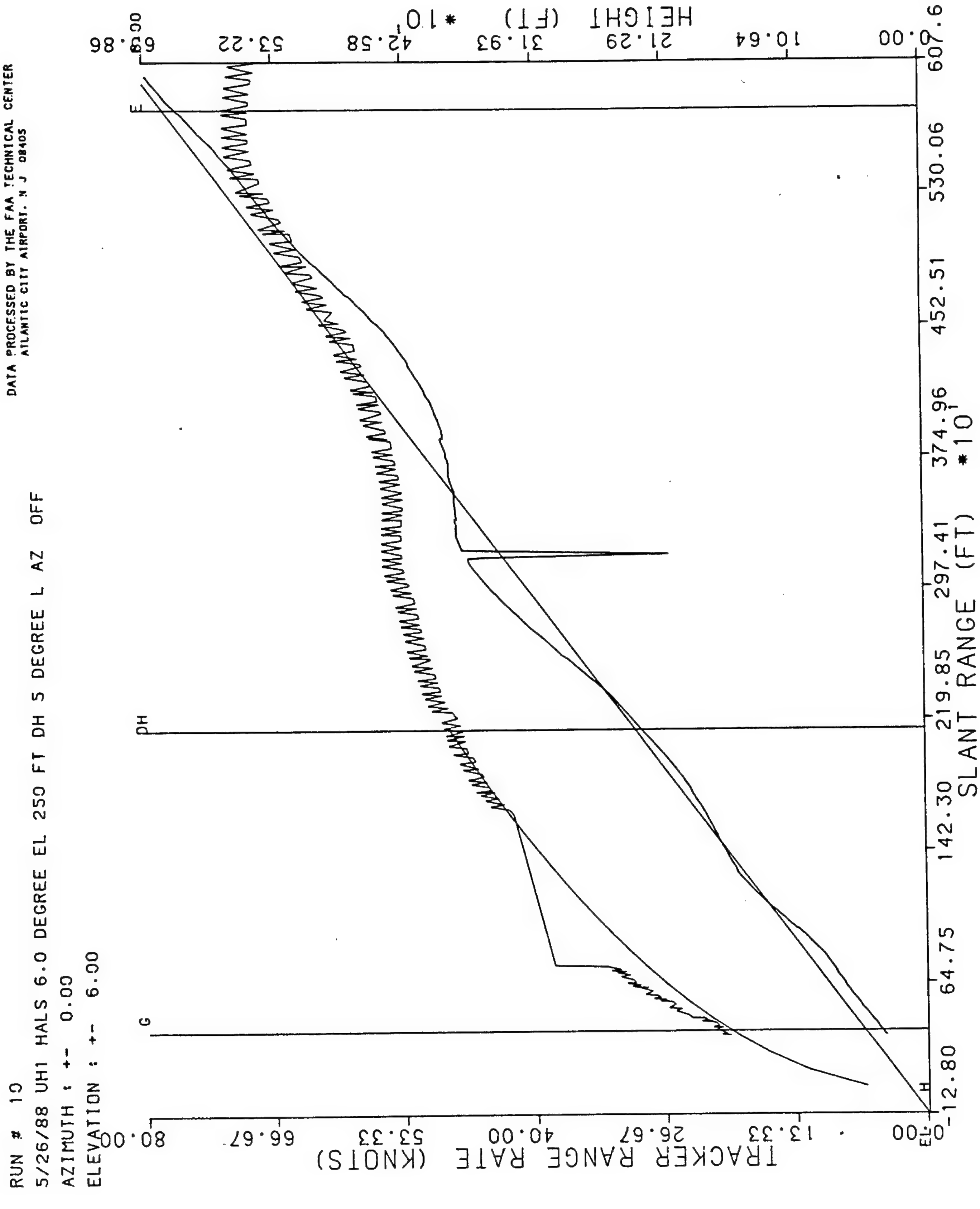
5/26/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 5 DEGREE R AZ ON

AZIMUTH : +- 0.00

ELEVATION : +- 6.00

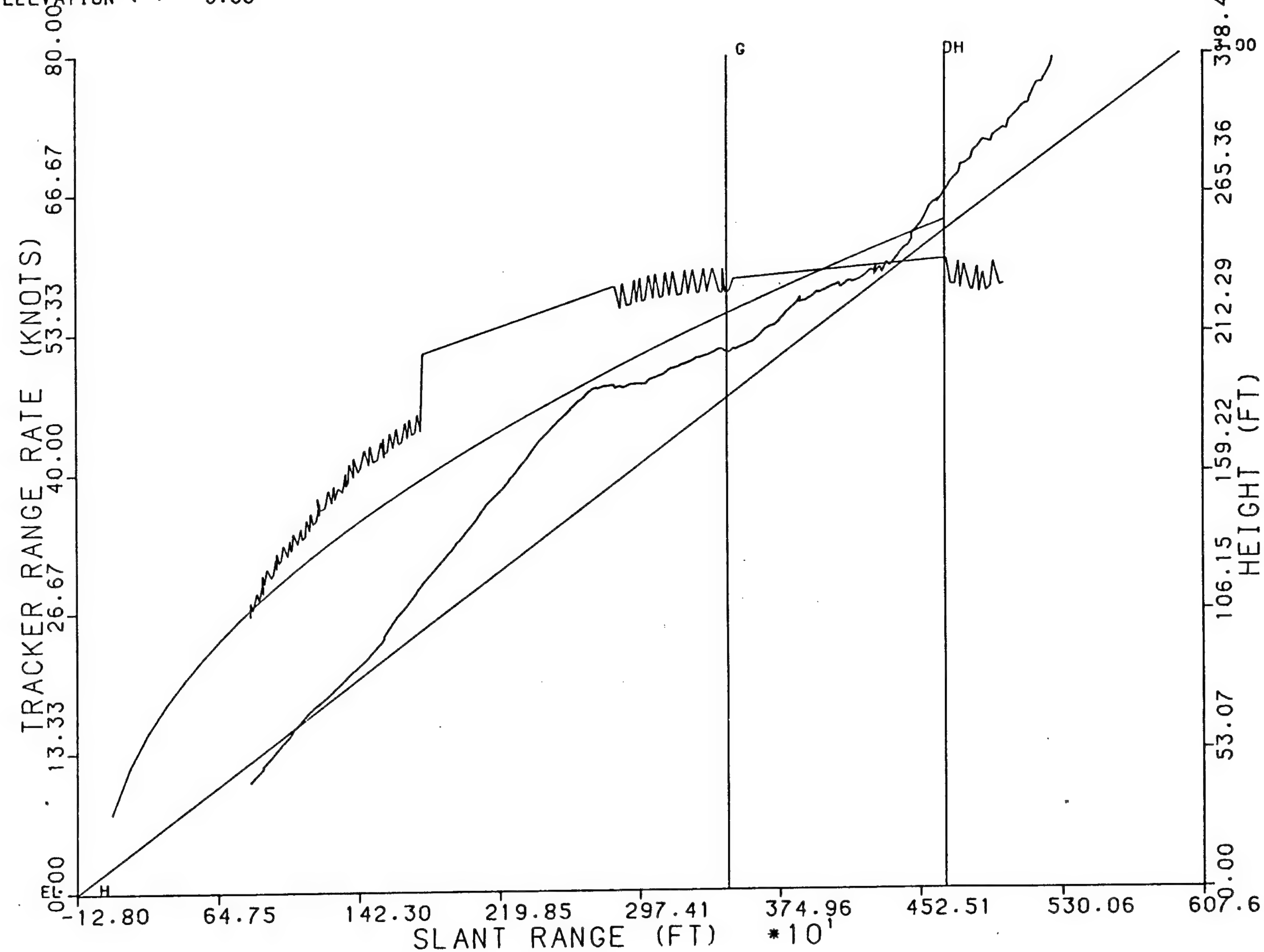
DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT. N J 08405




DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405
RUN # 10
5/26/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 5 DEGREE L AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 6.00
TRACKER RANGE RATE (KNOTS)
0.00 13.33 26.67 40.00 53.33 66.67 80.00
HEIGHT (FT) *10^1
0.00 10.64 21.29 31.93 42.58 53.22 63.86
SLANT RANGE (FT) *10^1
-12.80 64.75 142.30 219.85 297.41 374.96 452.51 530.06 607.61
E
DH
G
H
EL

RUN # 1
6/2/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



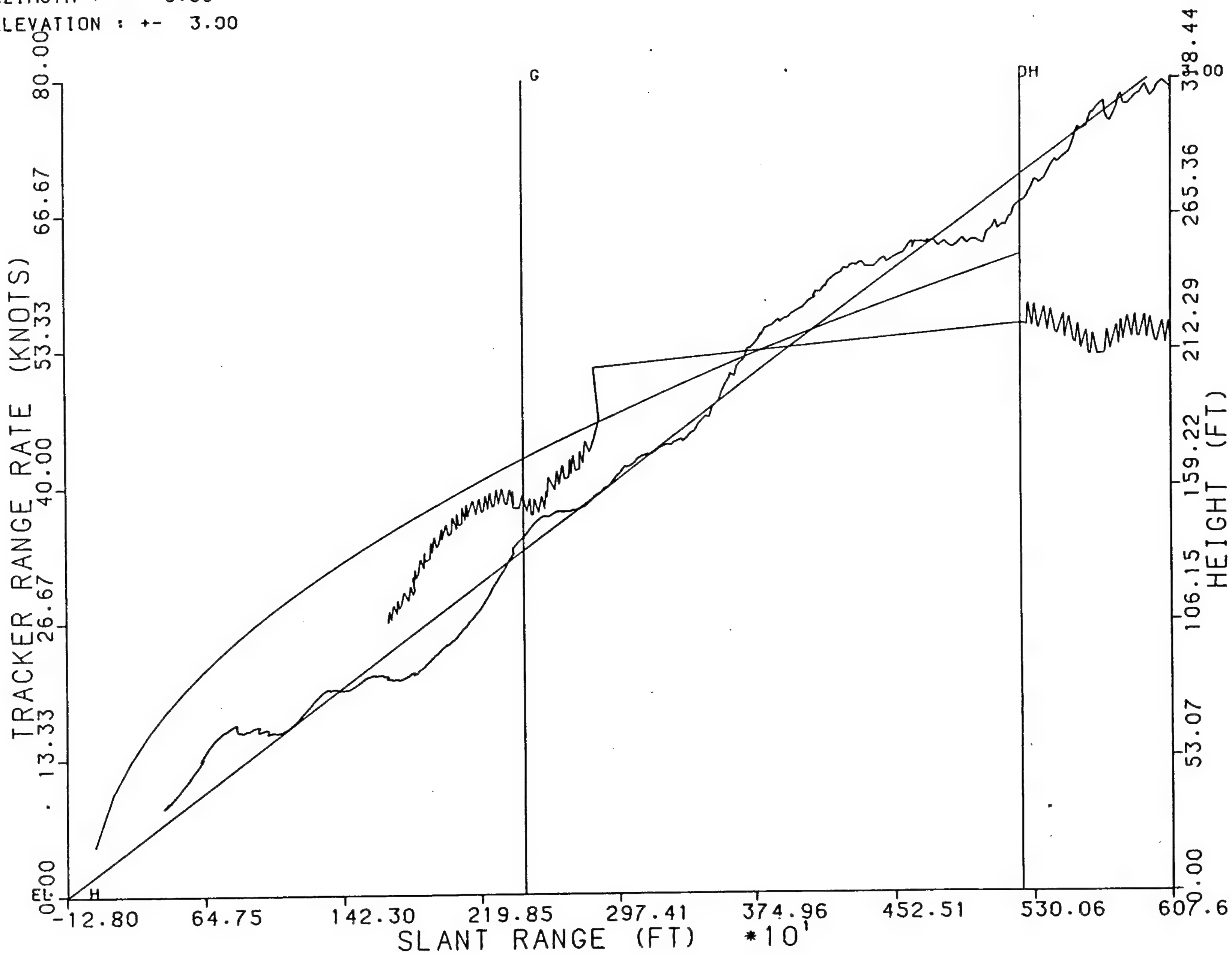
RUN # 2

6/2/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ OFF

AZIMUTH : +- 0.00

ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



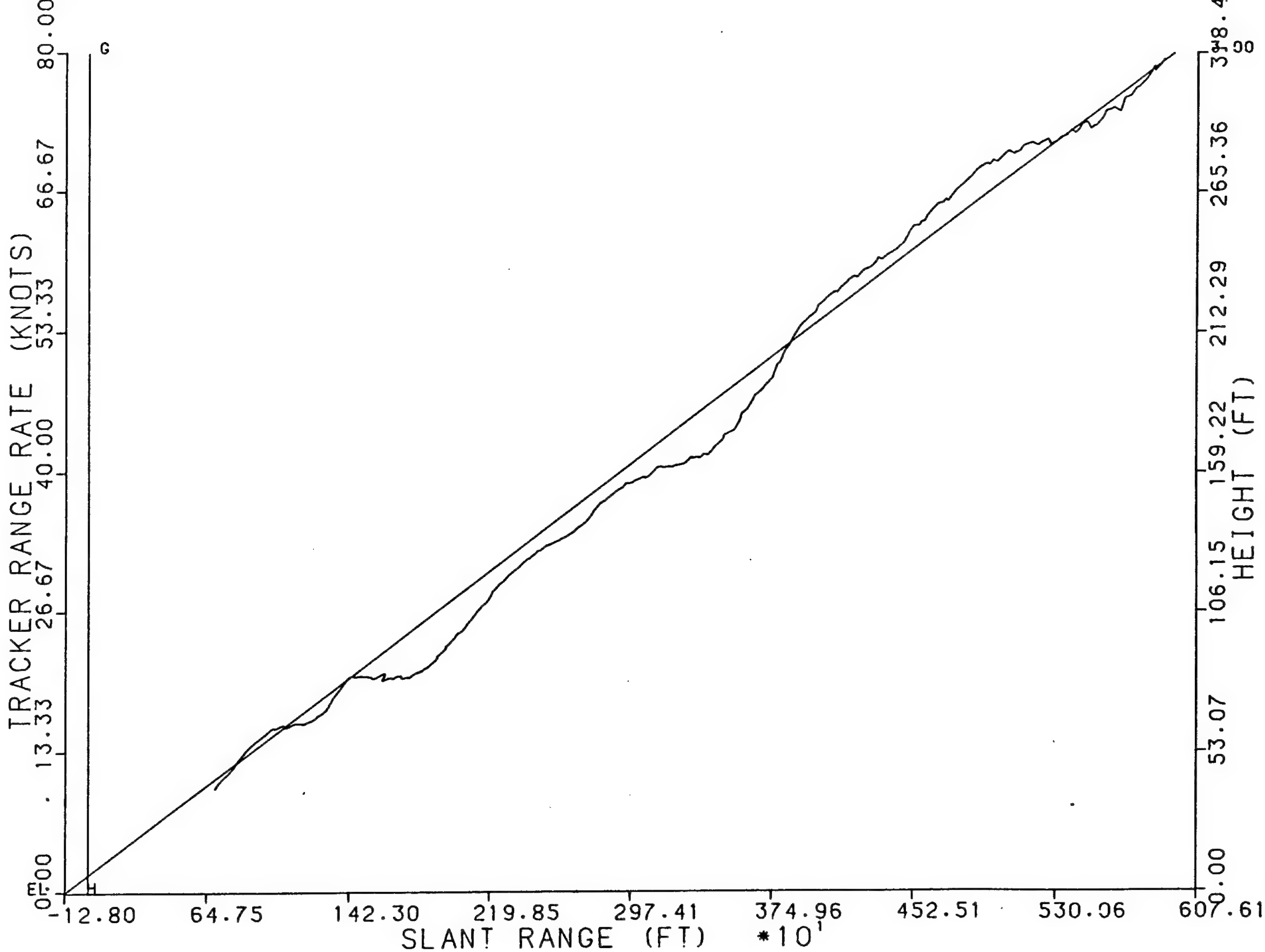
RUN # 3

6/2/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 5 DEGREE R AZ ON

AZIMUTH : +- 0.00

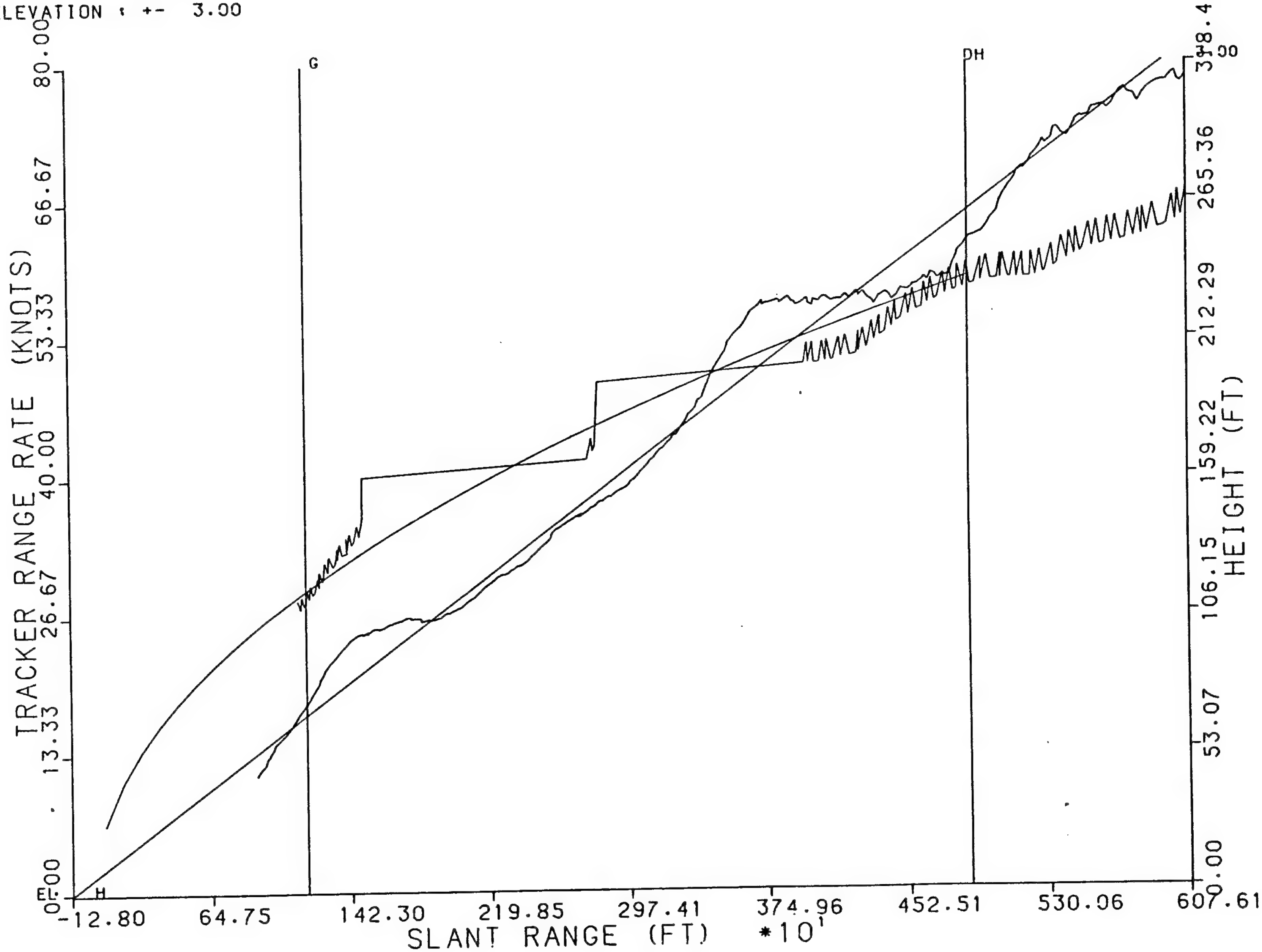
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 4
6/2/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 5 DEGREE L AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT. N J 08405



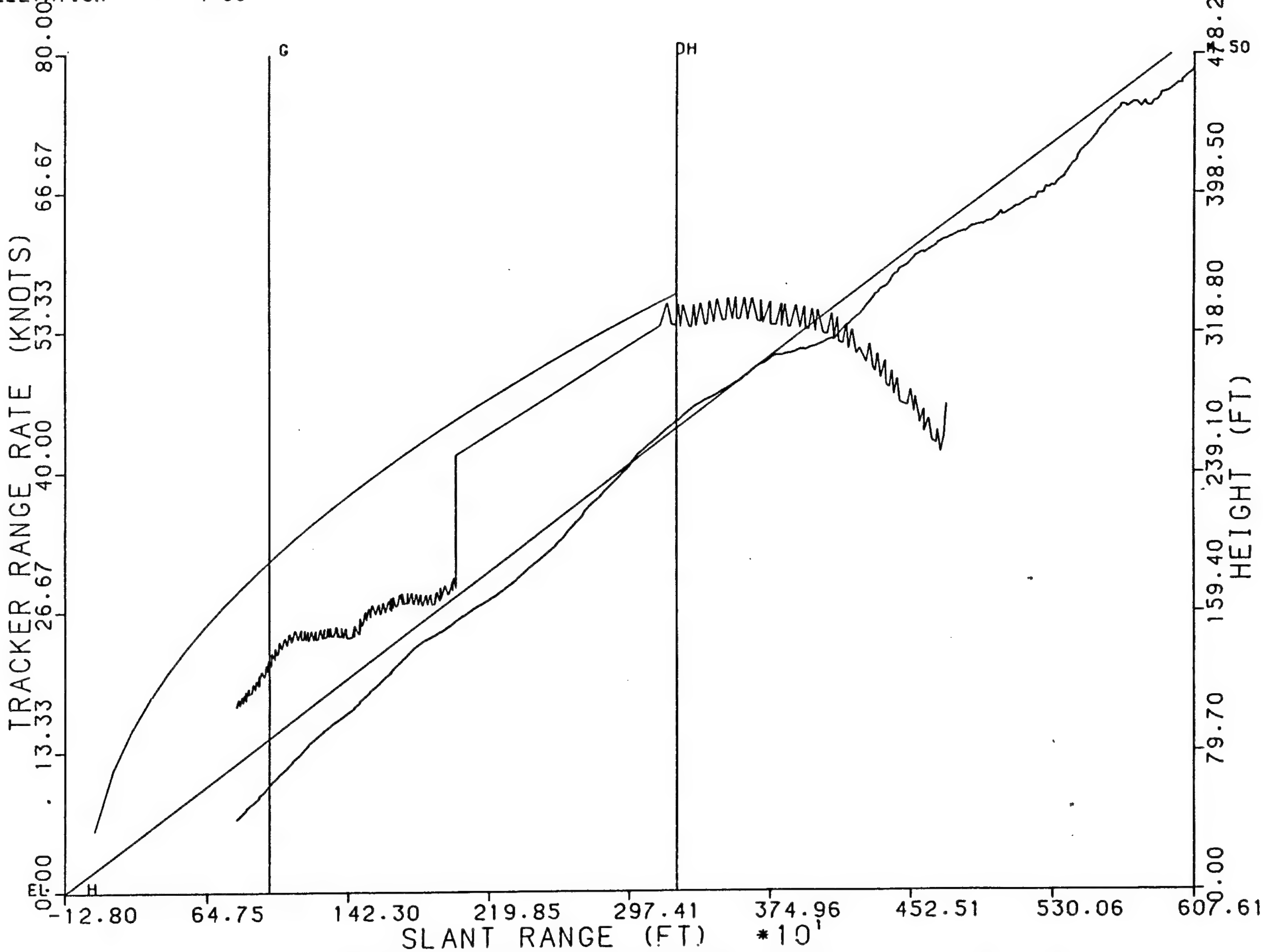
RUN # 5

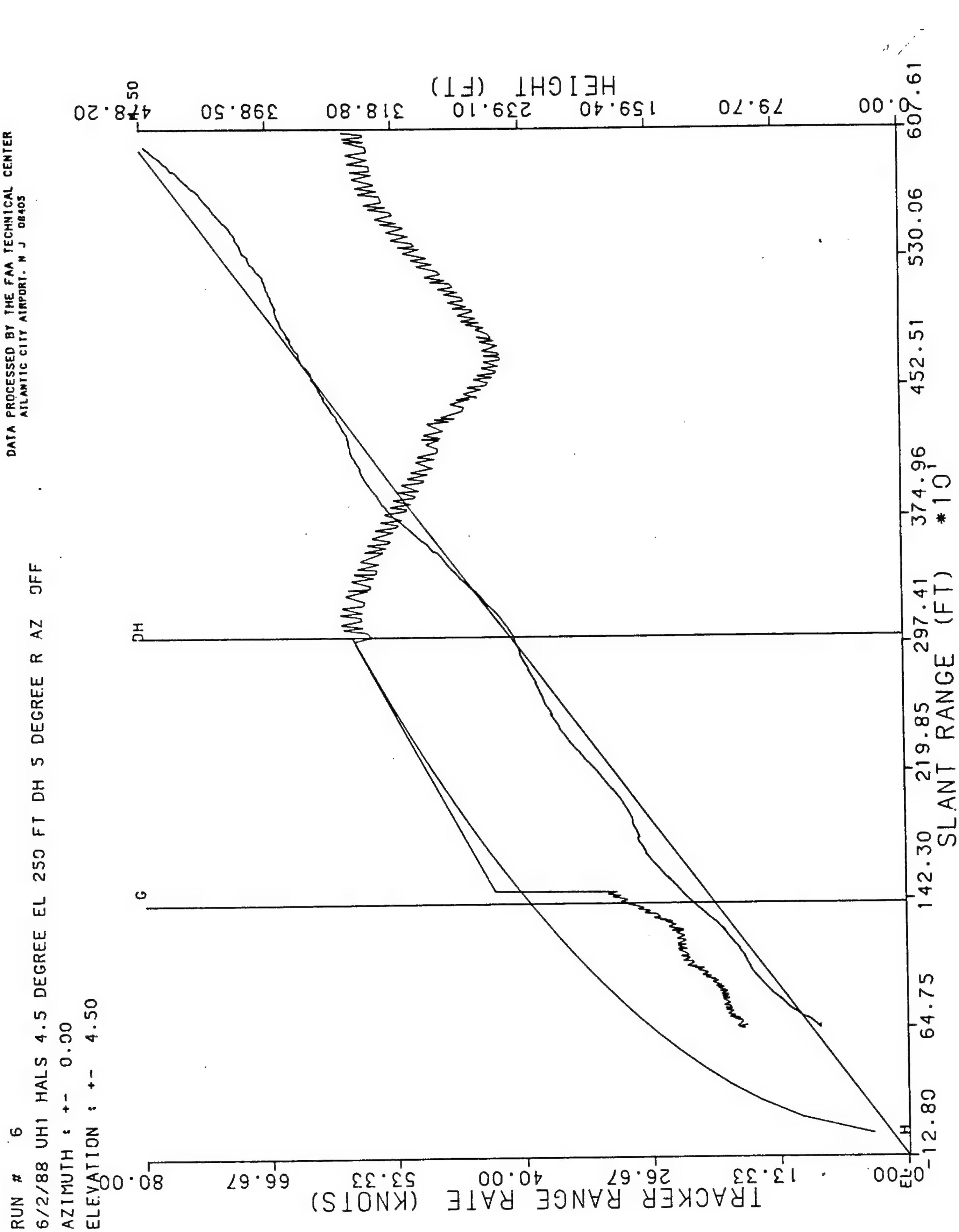
6/2/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 0 DEGREE AZ ON

AZIMUTH : +- 0.00

ELEVATION : +- 4.50

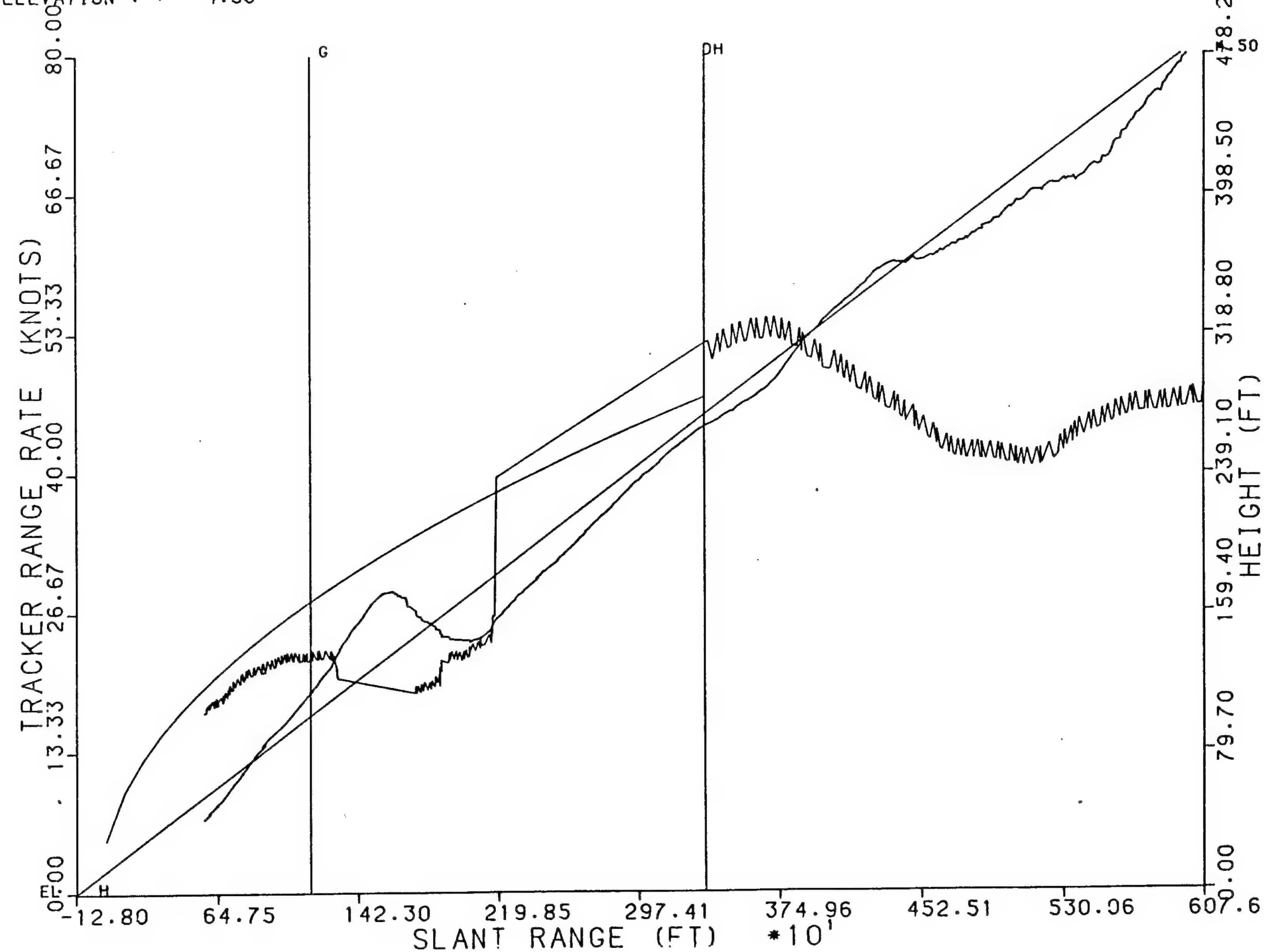
DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405




RUN # 6
6/2/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE R AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 4.50
DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405
TRACKER RANGE RATE (KNOTS)
0.00
13.33
26.67
40.00
53.33
66.67
80.00
HEIGHT (FT)
0.00
79.70
159.40
239.10
318.80
398.50
478.20
SLANT RANGE (FT) *10^1
-12.80
64.75
142.30
219.85
297.41
374.96
452.51
530.06
607.61
G
DH
H
EL

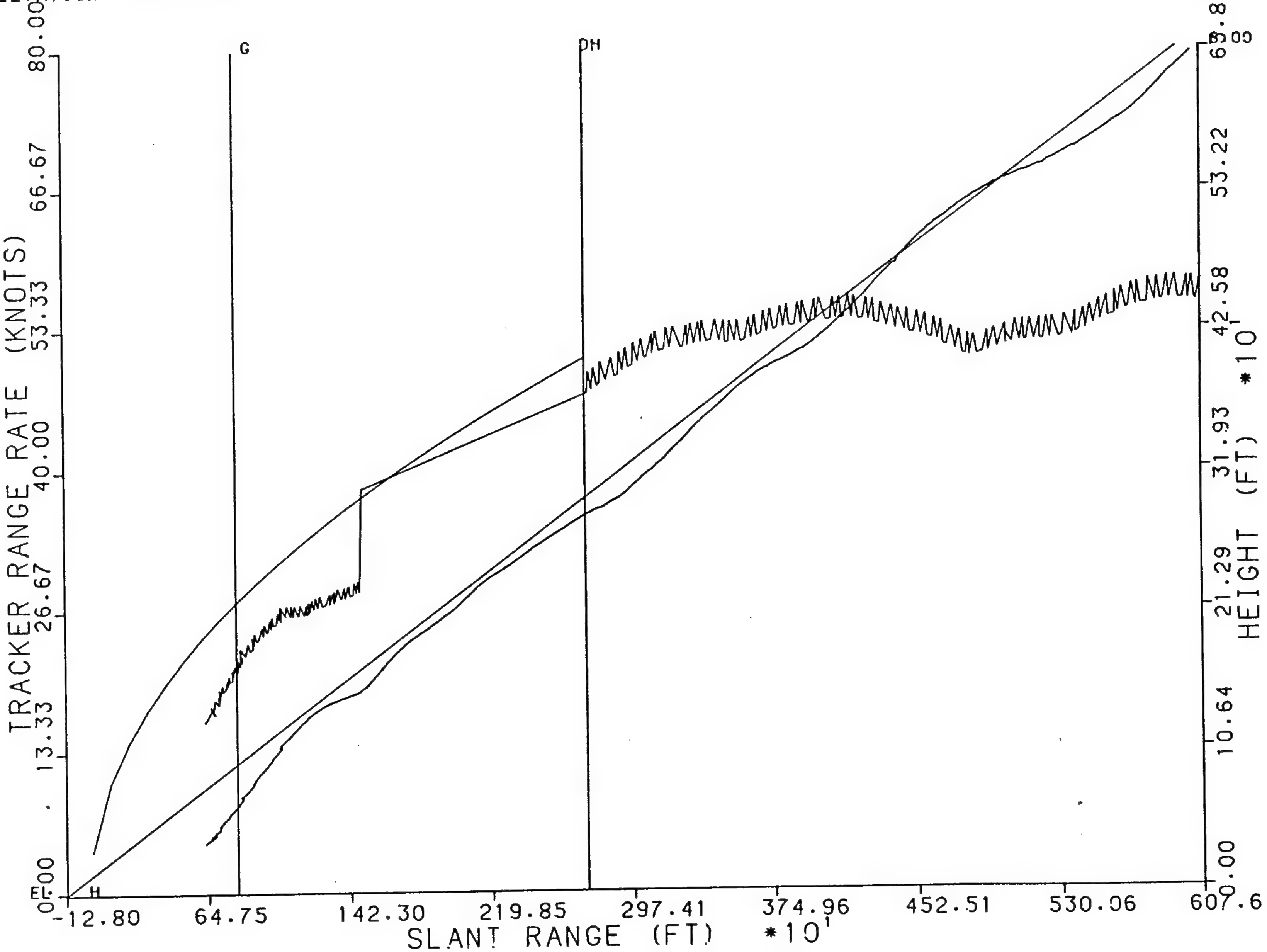
RUN # 7
6/2/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE L AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 8
6/2/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



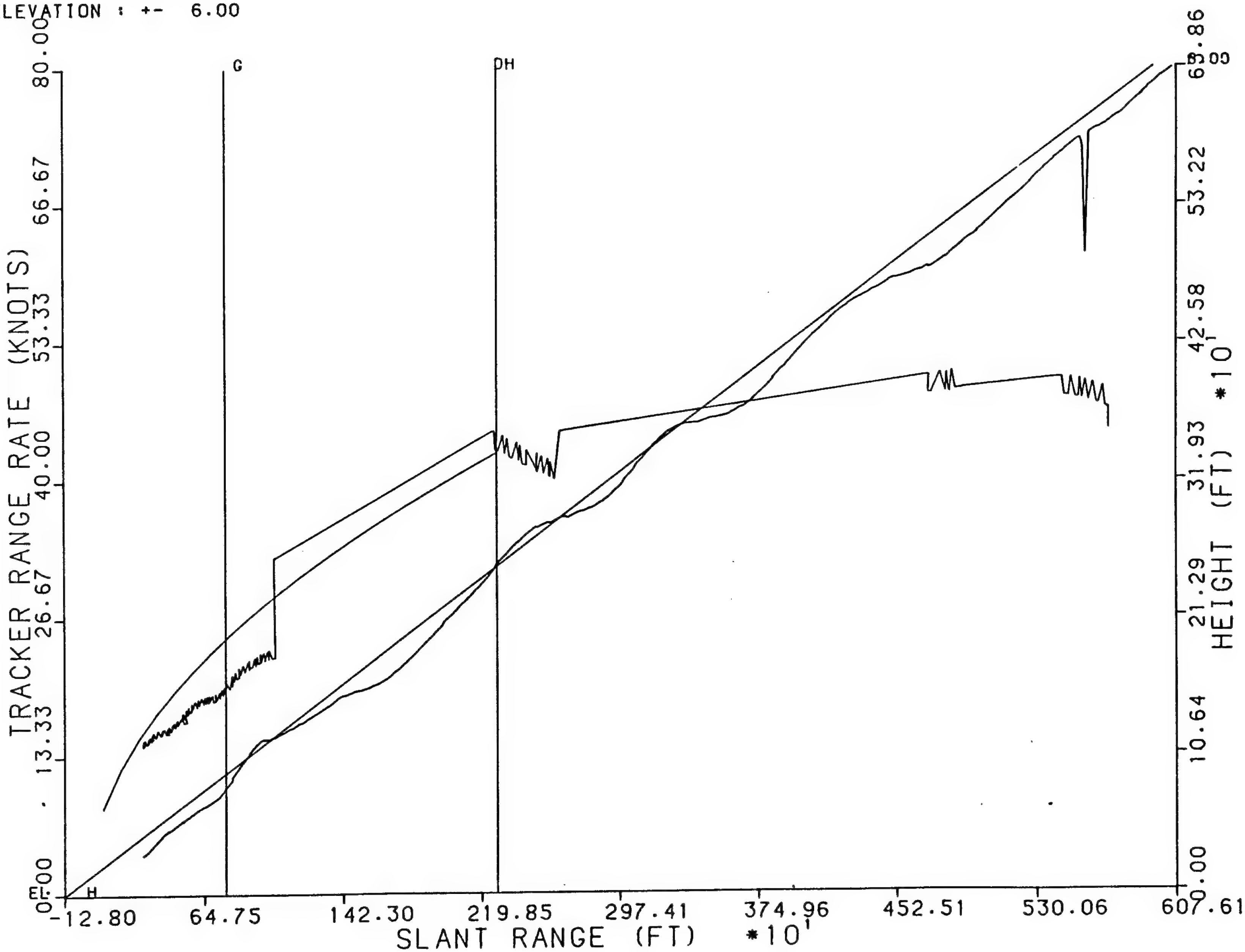
RUN # 9

6/2/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 5 DEGREE R AZ ON

AZIMUTH : +- 0.00

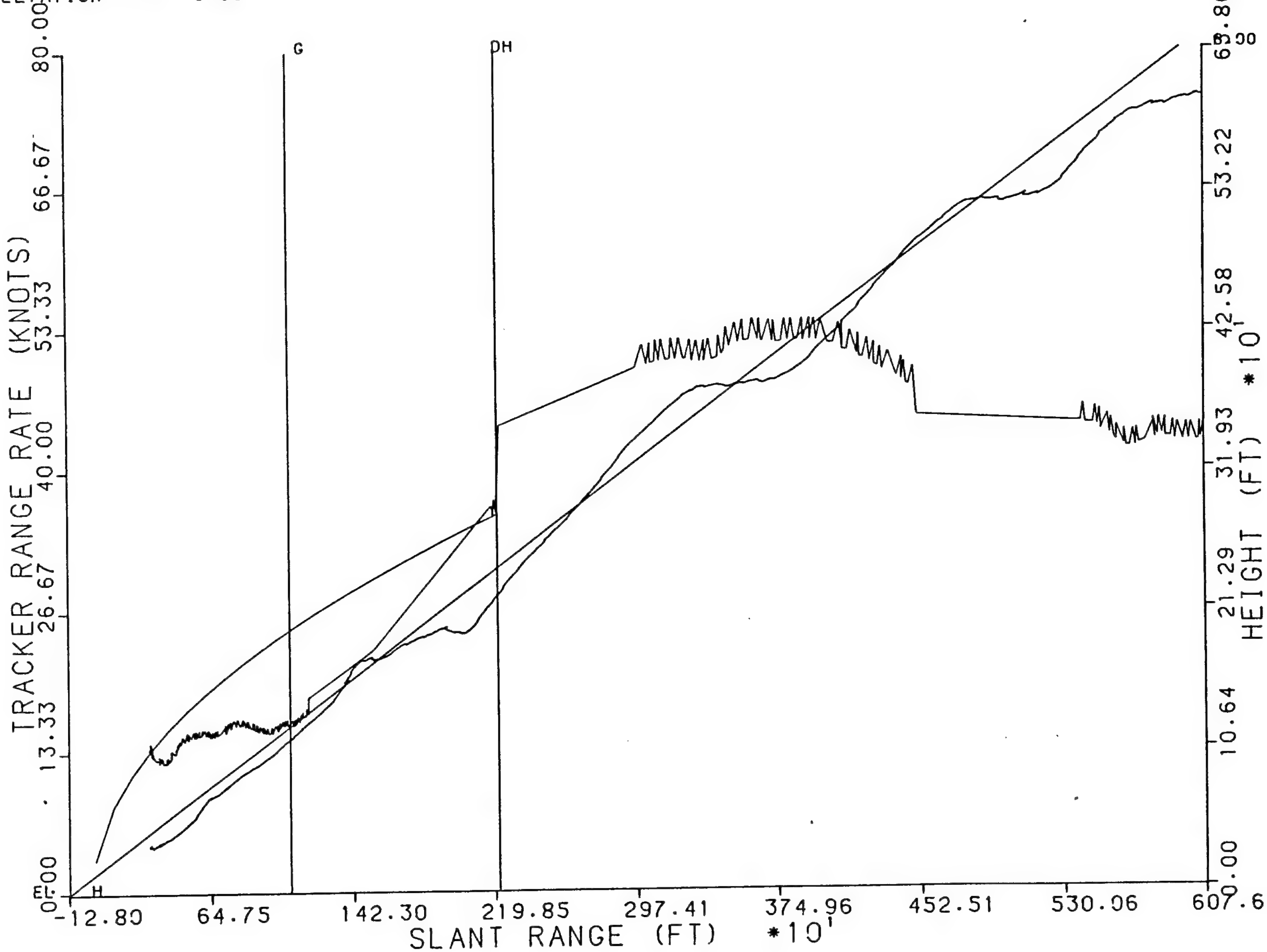
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



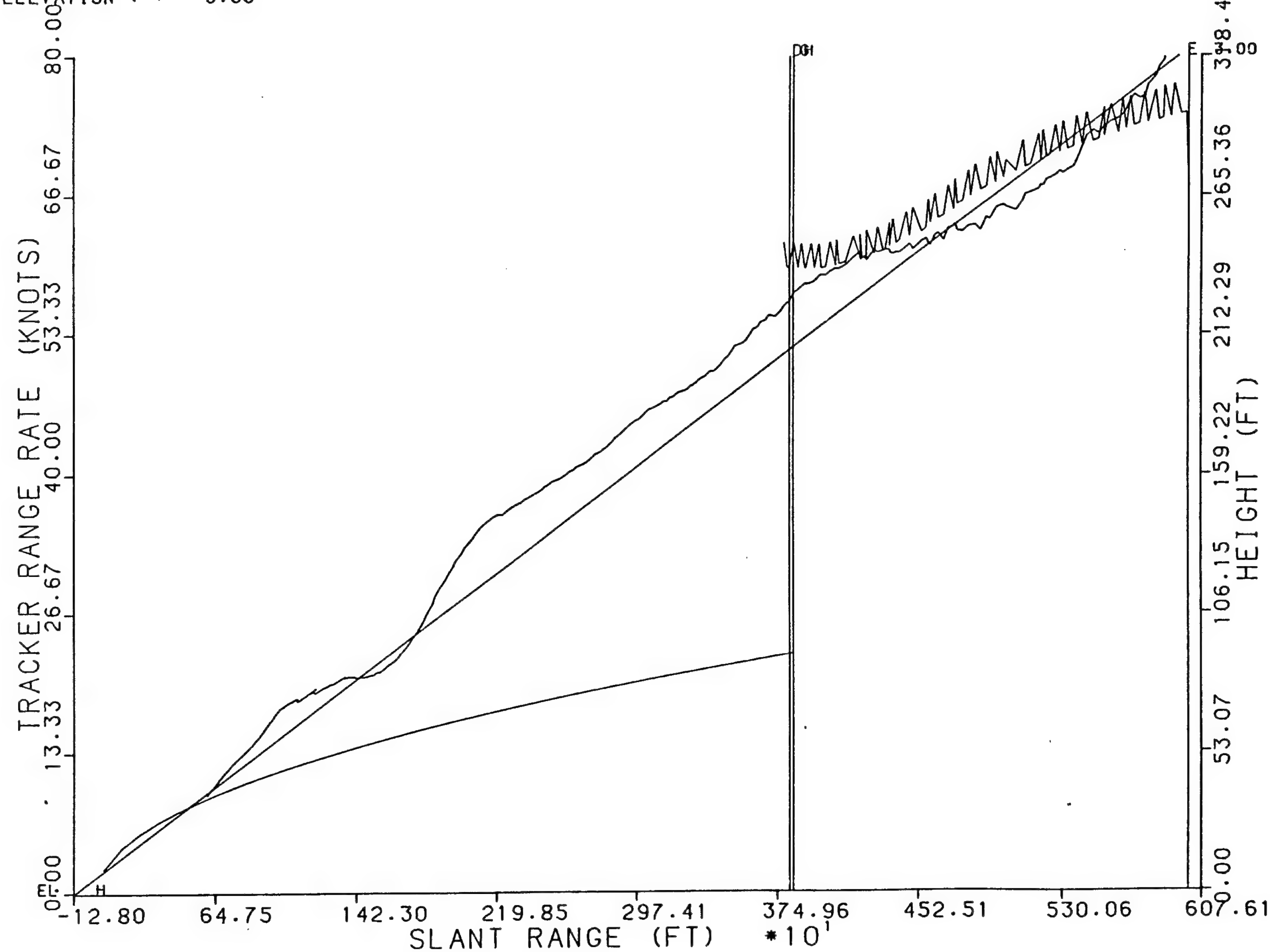
RUN # 10
6/2/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 5 DEGREE L AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 1
6/6/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



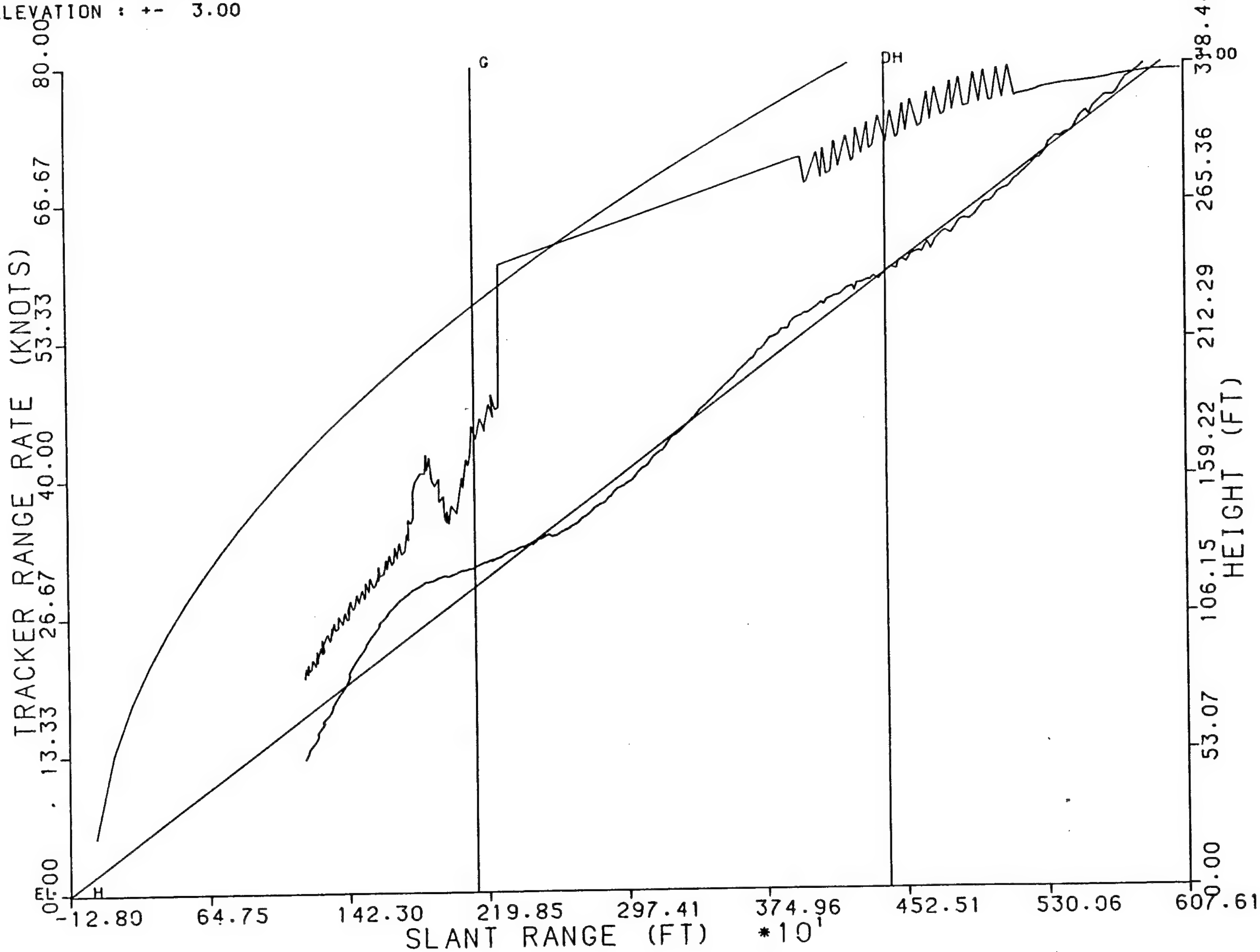
RUN # 2

6/6/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ OFF

AZIMUTH : +- 0.00

ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



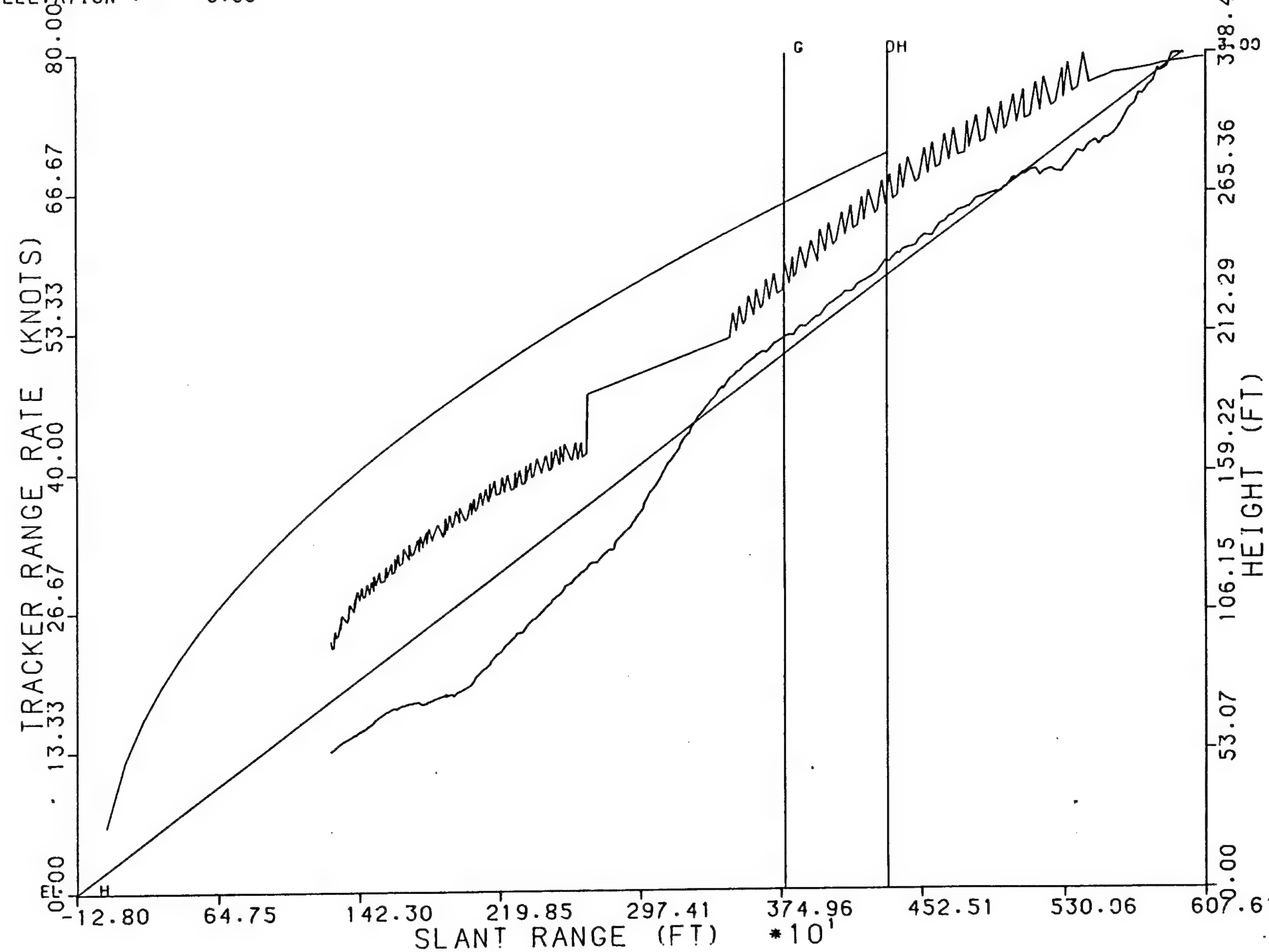
RUN # 3

6/6/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 5 DEGREE R AZ ON

AZIMUTH : +- 0.00

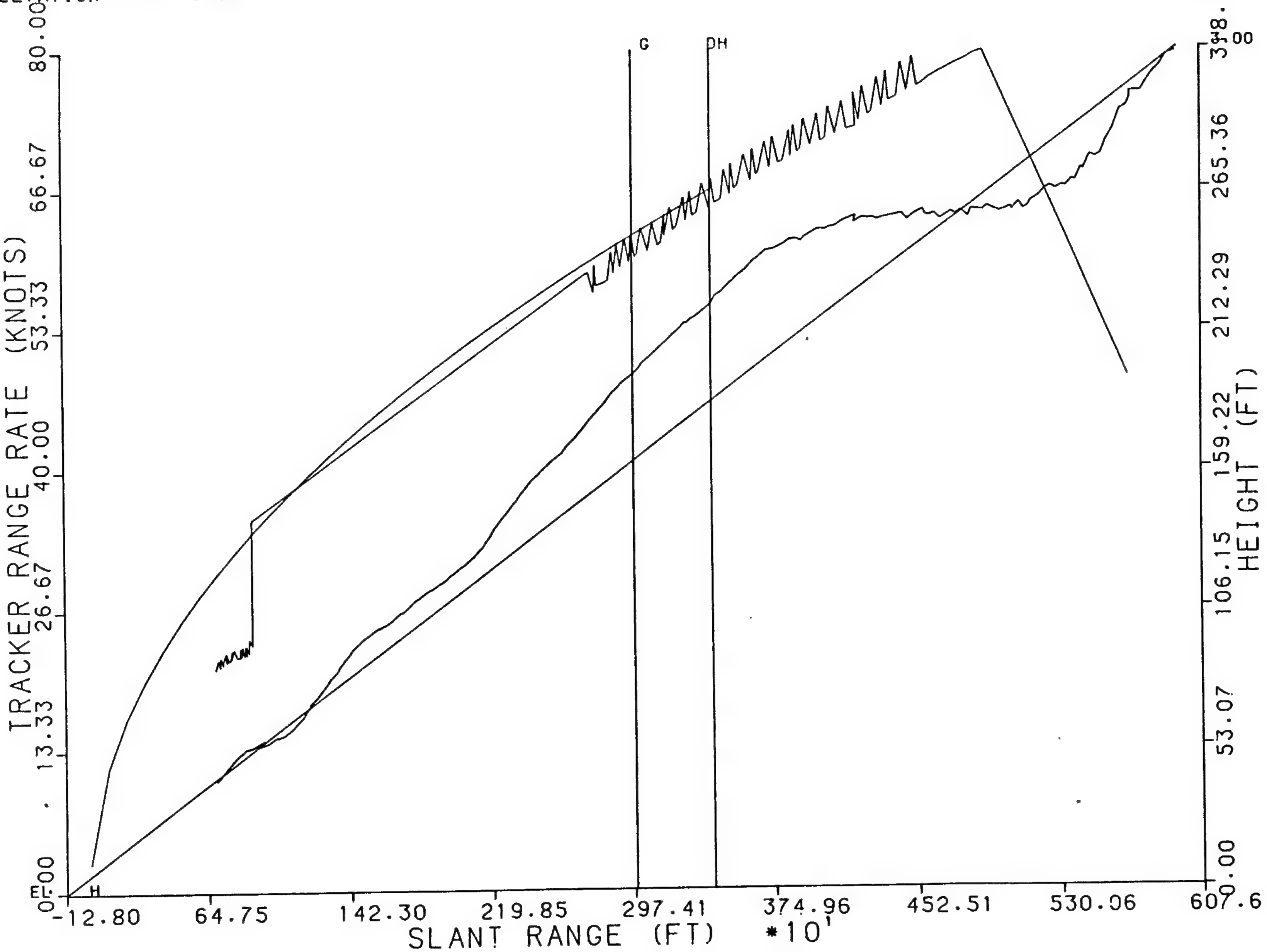
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT. N J 08405



RUN # 4
6/6/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 5 DEGREE L AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



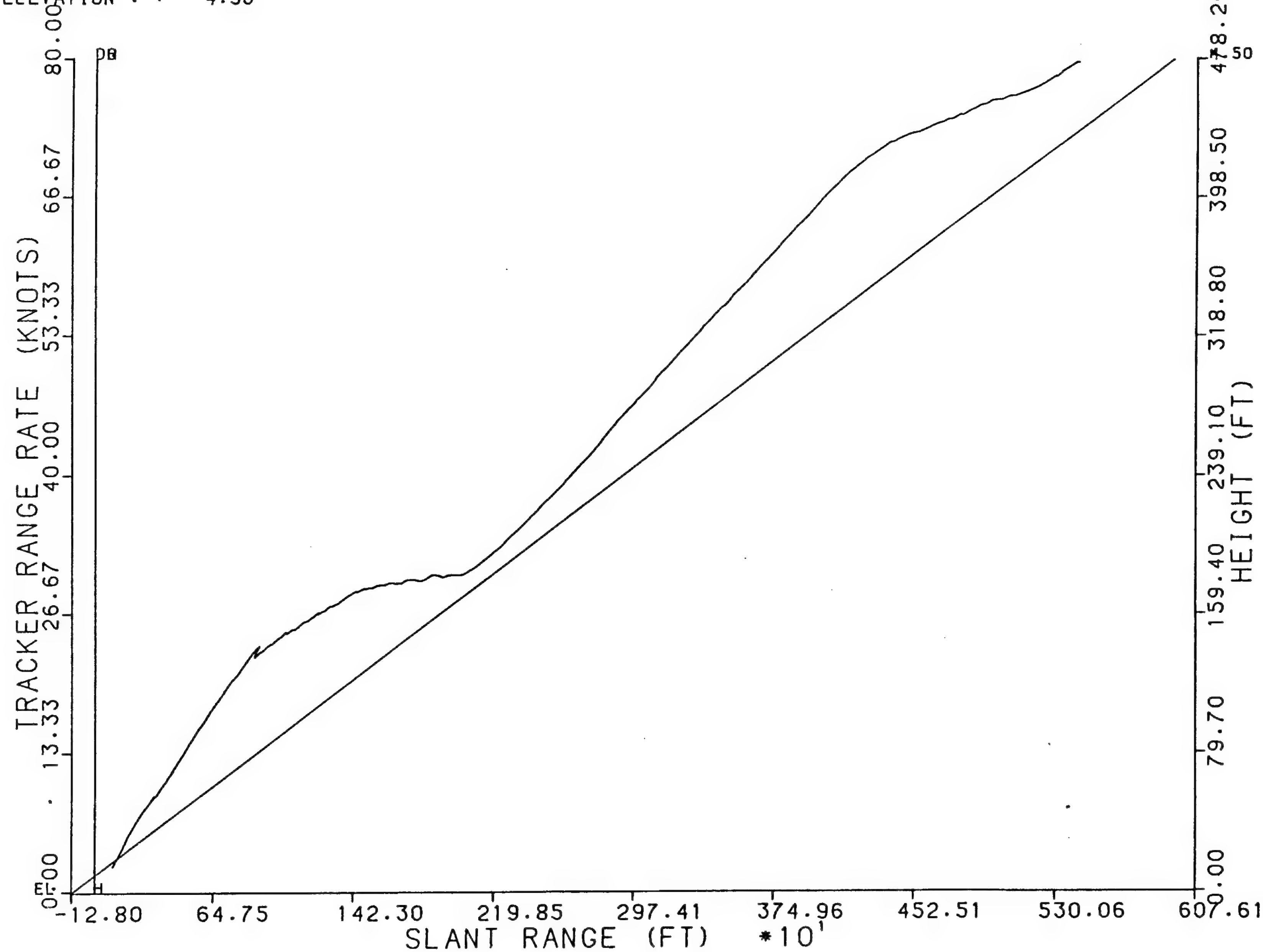
RUN # 5

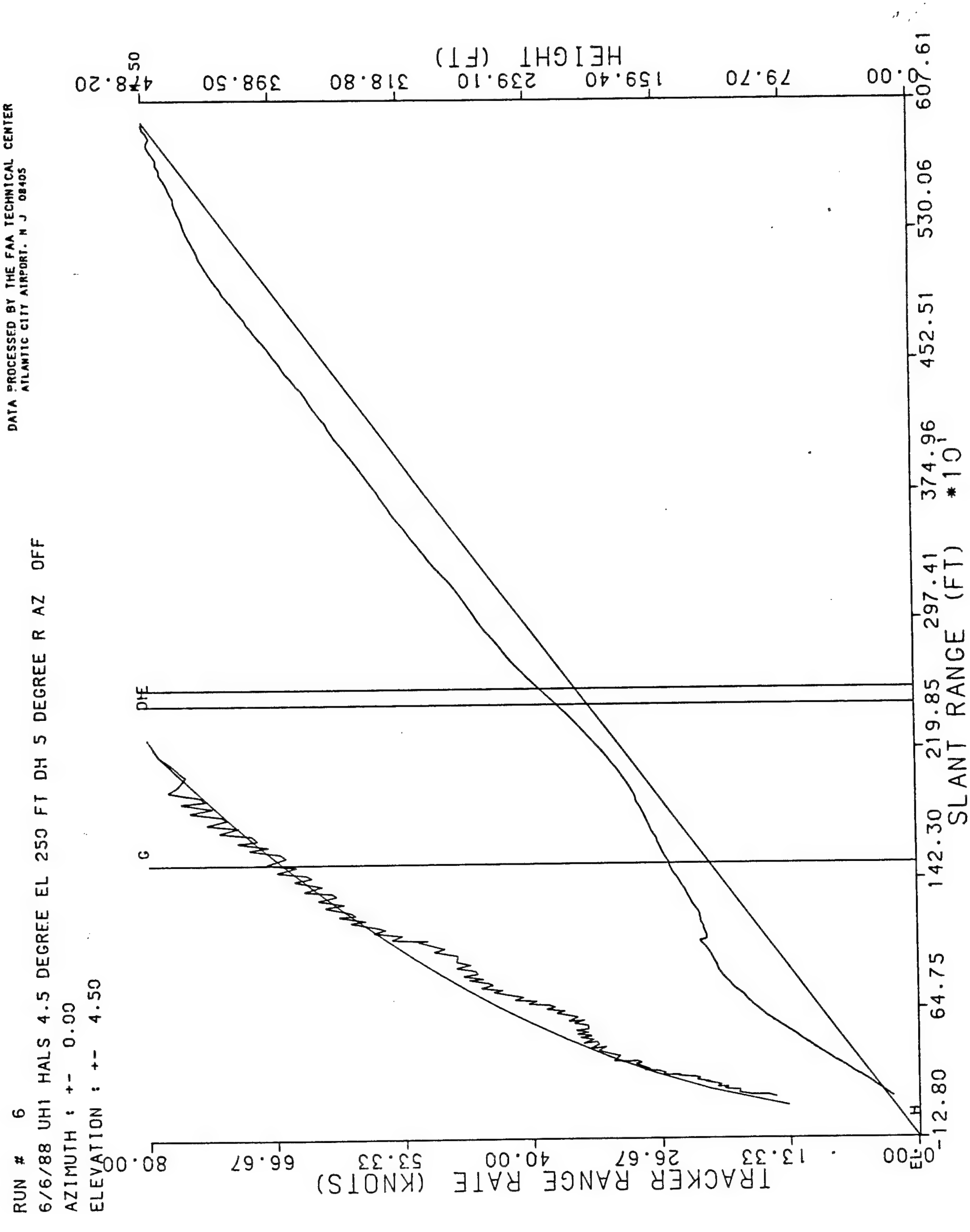
6/6/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 0 DEGREE AZ ON

AZIMUTH : +- 0.00

ELEVATION : +- 4.50

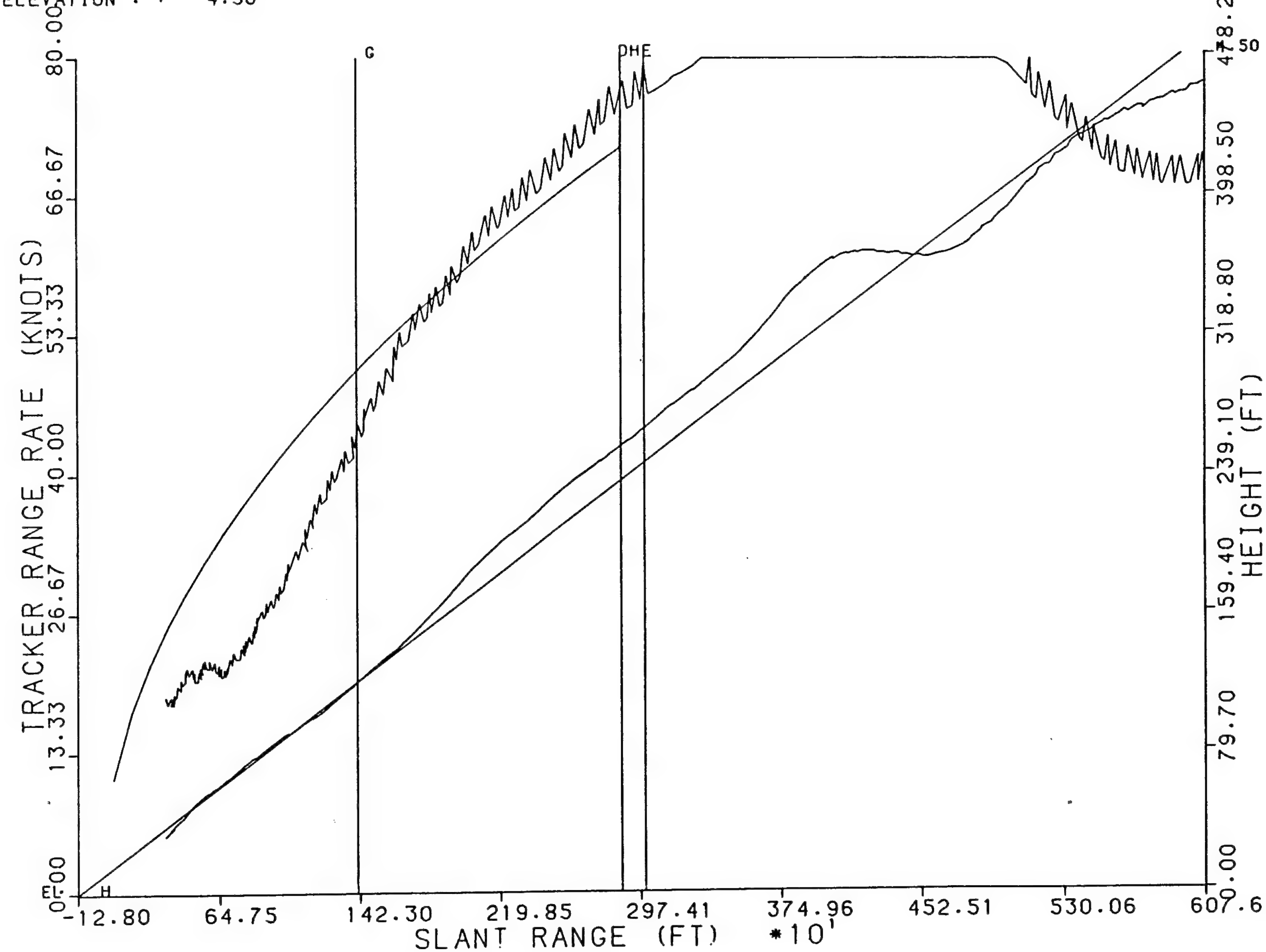
DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405




RUN # 6
6/6/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE R AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 4.50
DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405
HEIGHT (FT)
0.00
79.70
159.40
239.10
318.80
398.50
478.20
50
SLANT RANGE (FT) *10^1
-12.80
64.75
142.30
219.85
297.41
374.96
452.51
530.06
607.61
TRACKER RANGE RATE (KNOTS)
0.00
13.33
26.67
40.00
53.33
66.67
80.00
EL
H
G
DH
OFF

RUN # 7
6/6/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE L AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



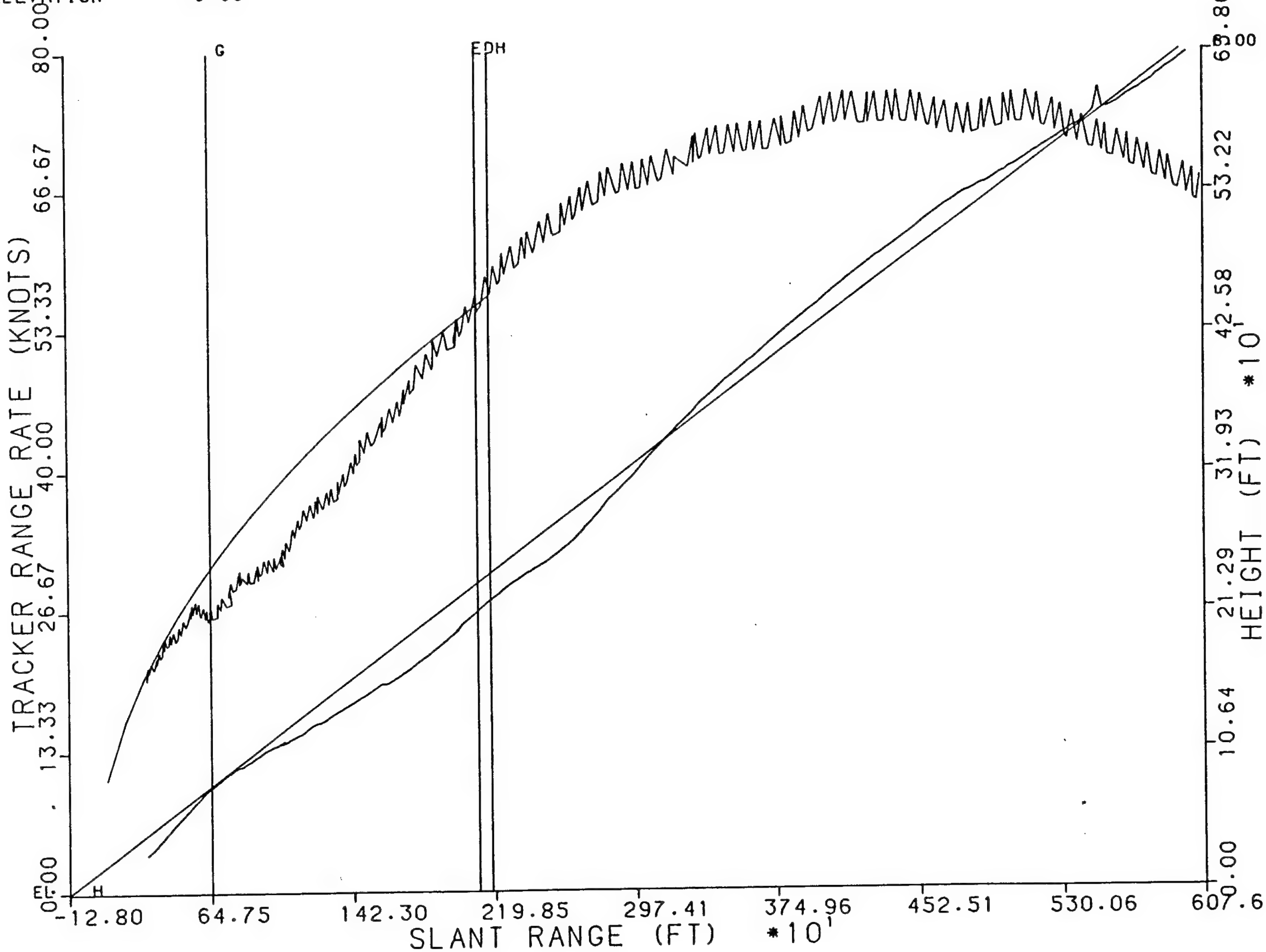
RUN # 8

6/6/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 0 DEGREE AZ ON

AZIMUTH : +- 0.00

ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



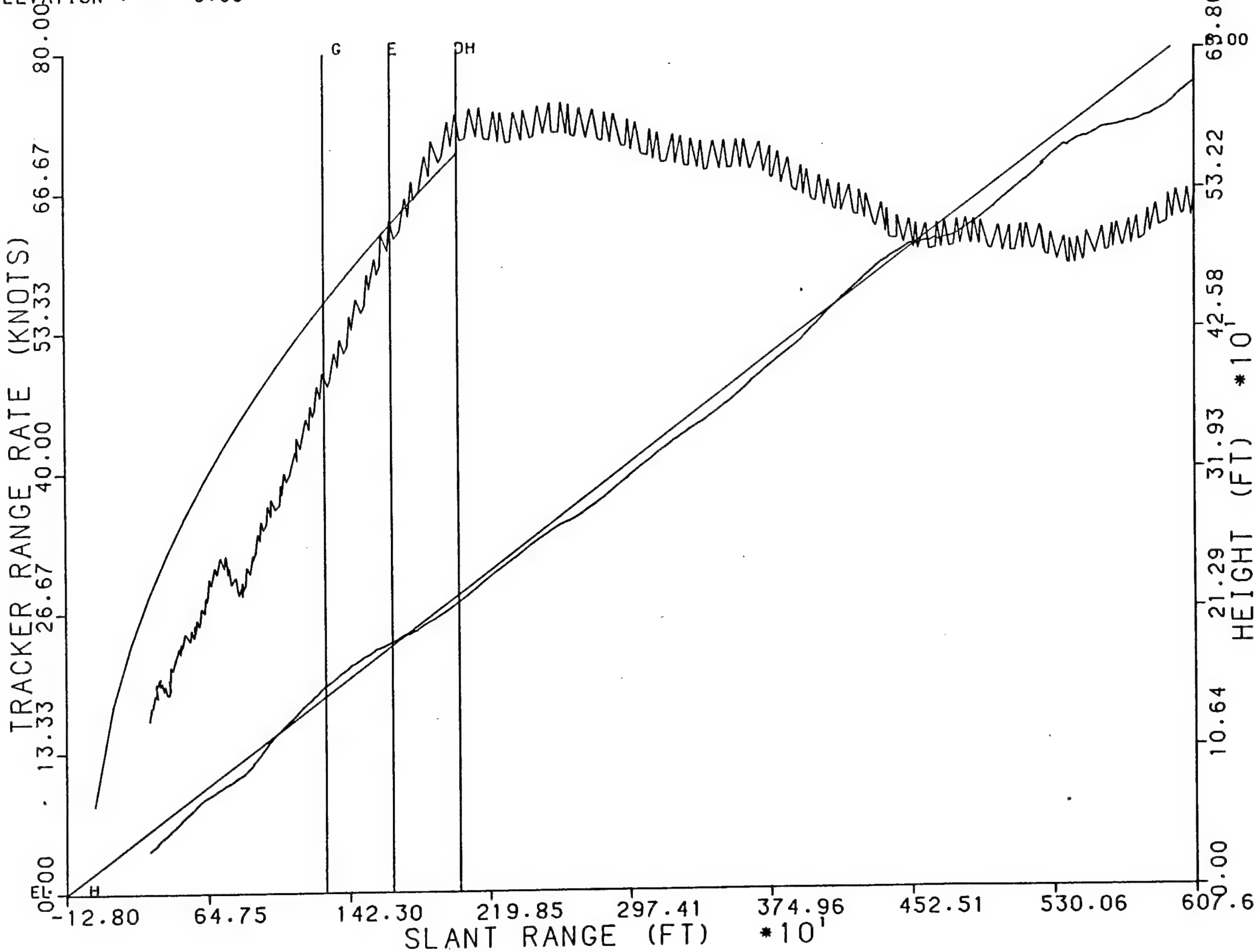
RUN # 9

6/6/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 5 DEGREE R AZ ON

AZIMUTH : +- 0.00

ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



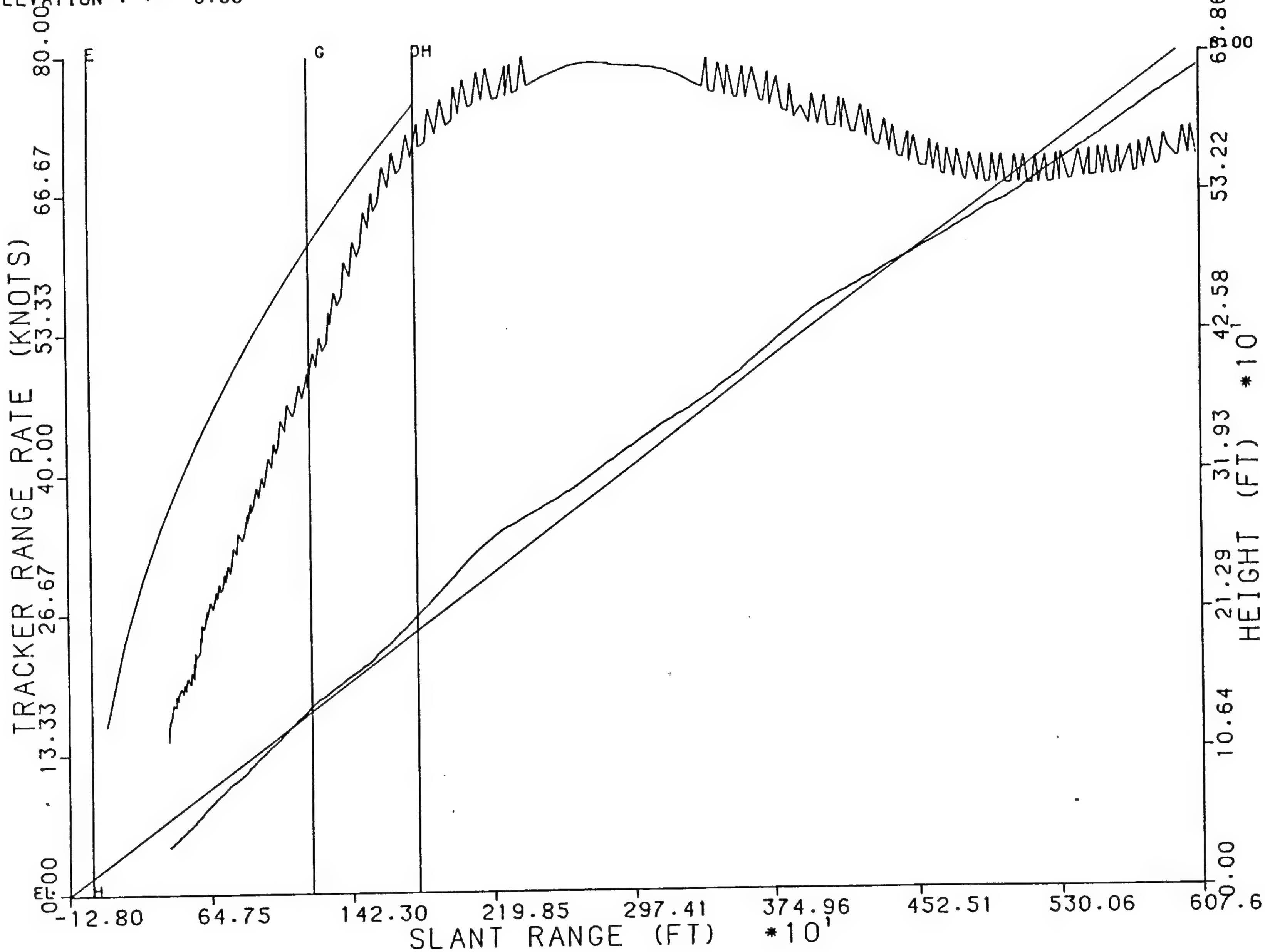
RUN # 10

6/6/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 5 DEGREE L AZ OFF

AZIMUTH : +- 0.00

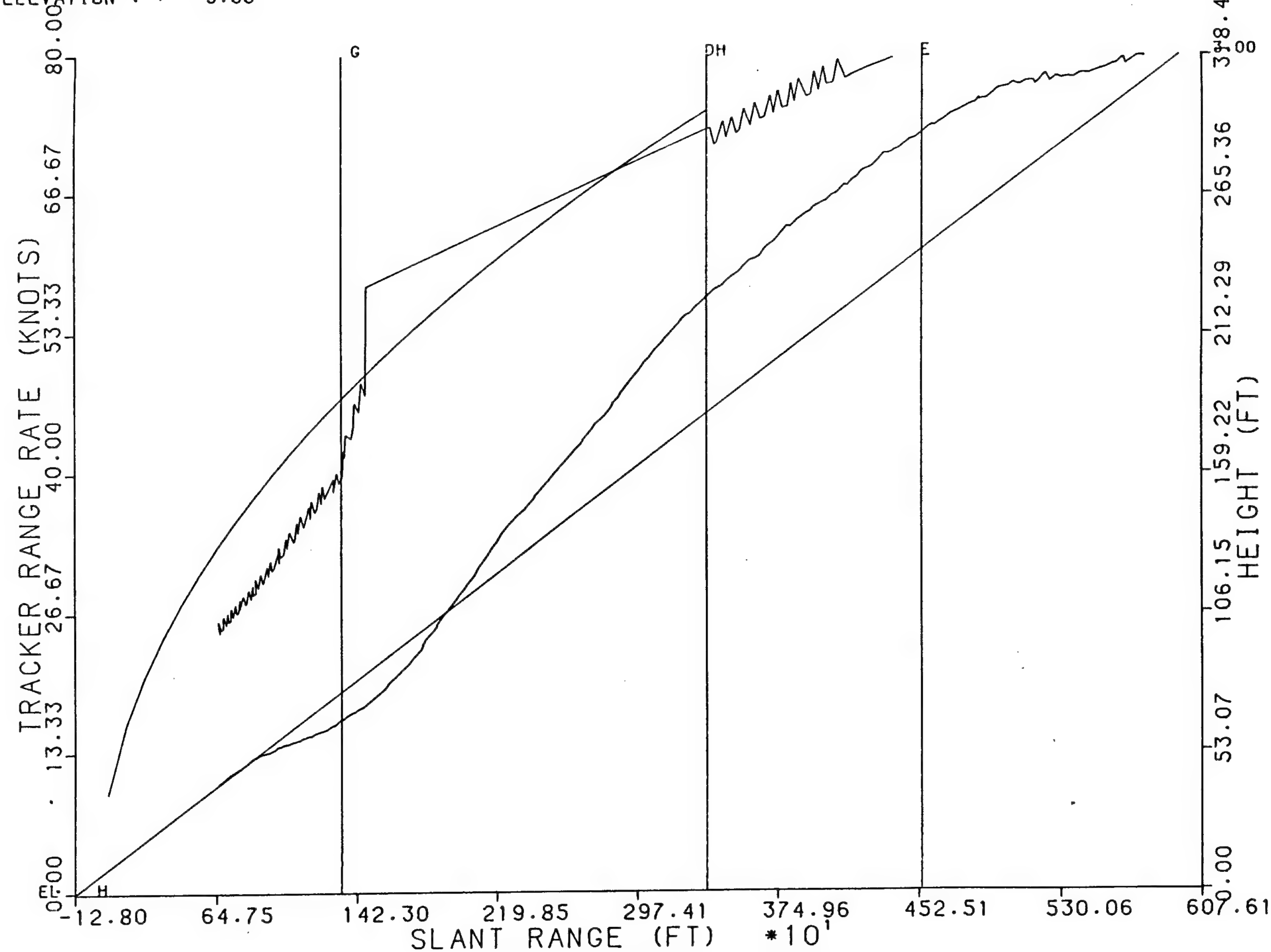
ELEVATION : +- 6.00

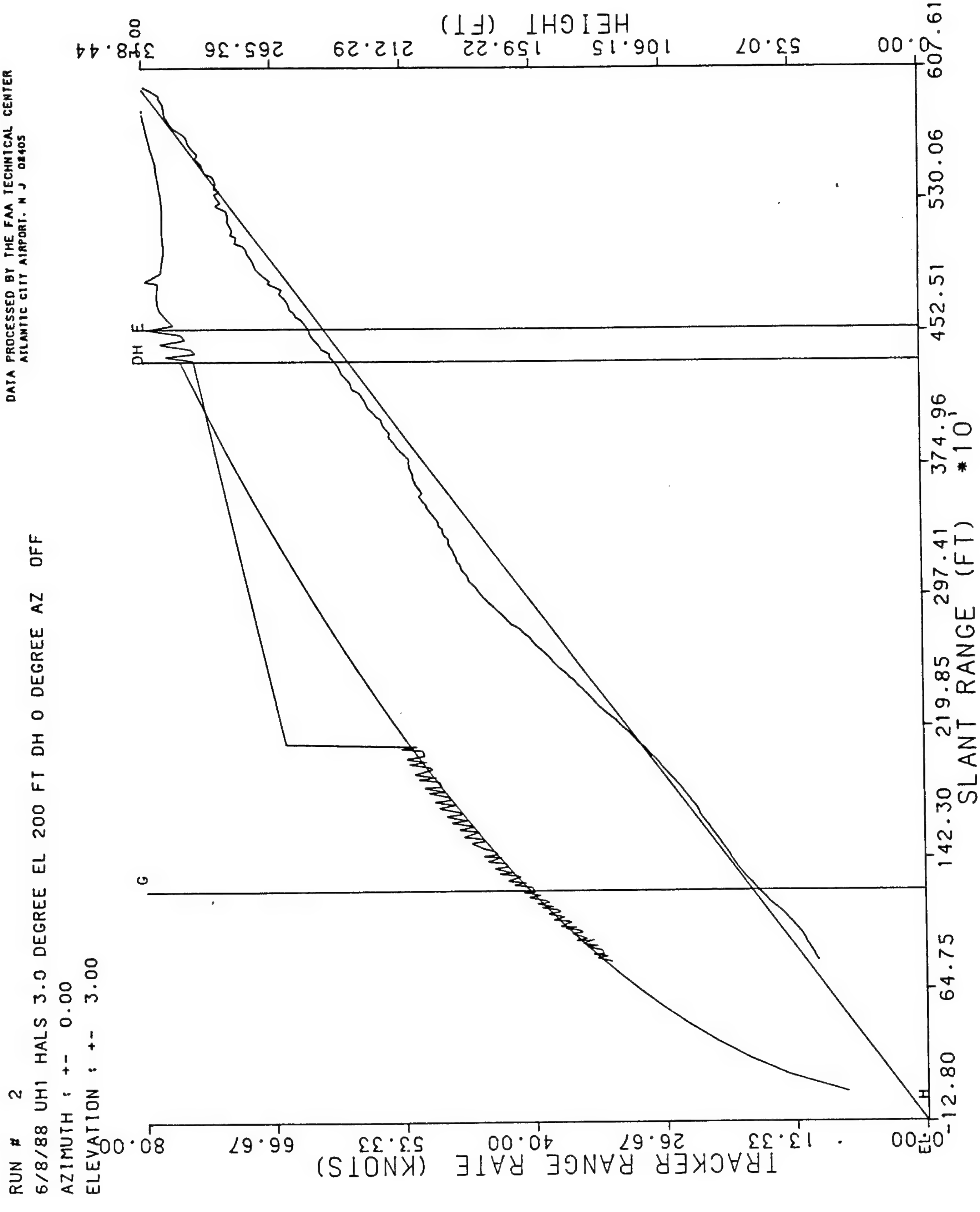
DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



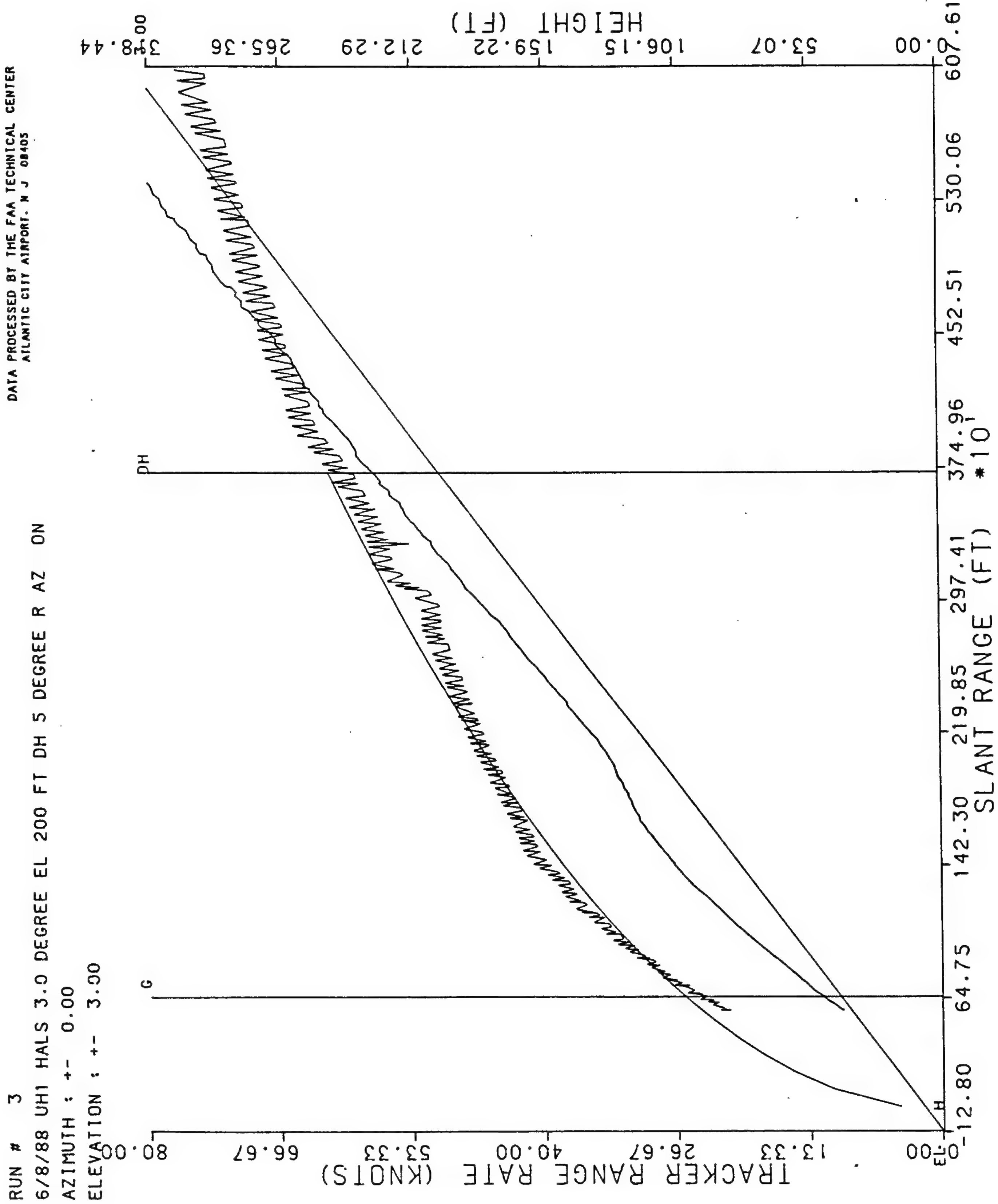
RUN # 1
6/8/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT. N J 08405



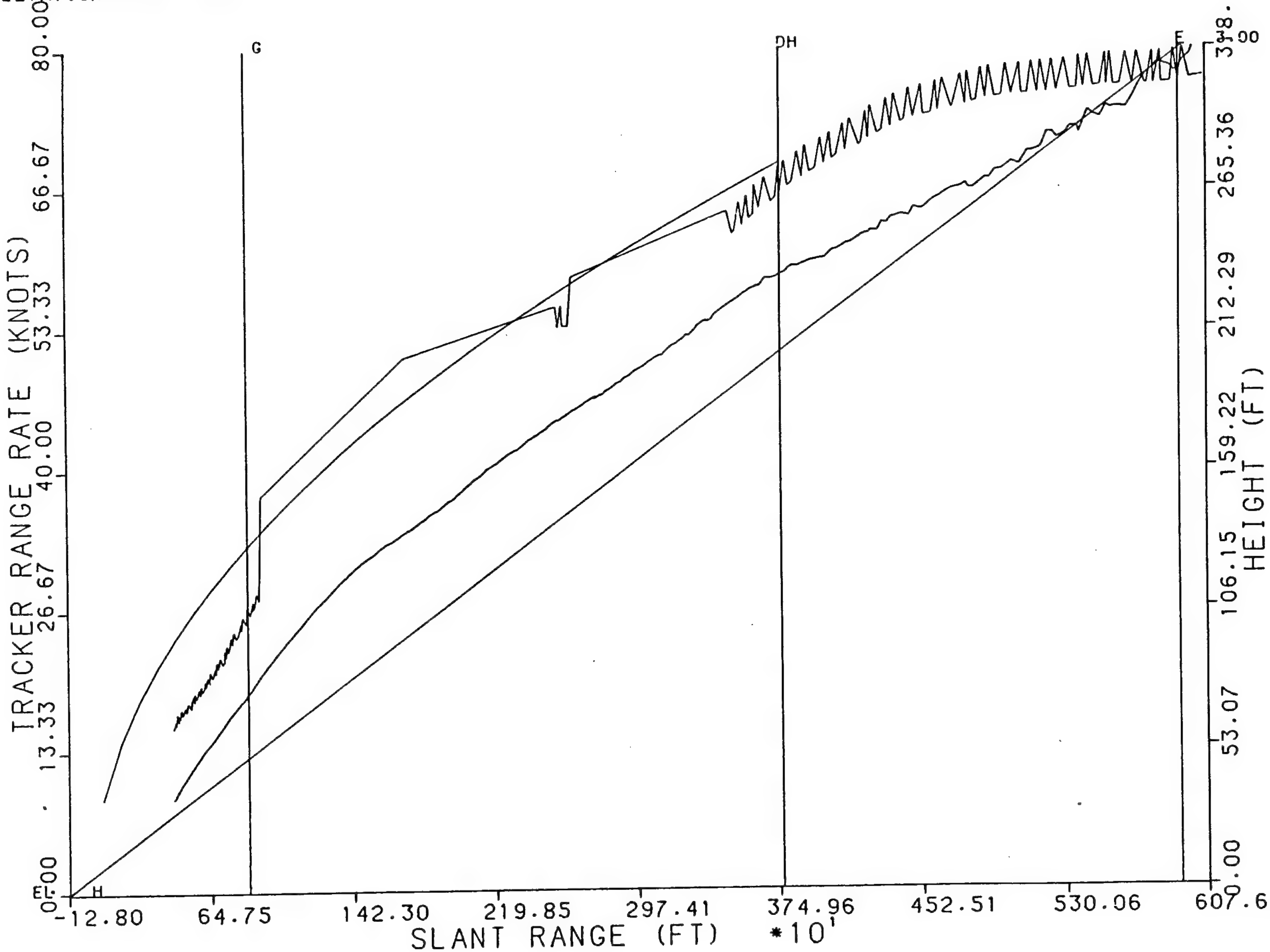


RUN # 2
6/8/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 3.00
DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405
TRACKER RANGE RATE (KNOTS)
HEIGHT (FT)
SLANT RANGE (FT) *10^{1}
80.00
66.67
53.33
40.00
26.67
13.33
0.00
348.44
265.36
212.29
159.22
106.15
53.07
0.00
-12.80
64.75
142.30
219.85
297.41
374.96
452.51
530.06
607.61
H
G
DH
E


RUN # 3
6/8/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 5 DEGREE R AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00
DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405
TRACKER RANGE RATE (KNOTS)
80.00
66.67
53.33
40.00
26.67
13.33
0.00
HEIGHT (FT)
318.44
265.36
212.29
159.22
106.15
53.07
0.00
SLANT RANGE (FT) *10¹
-12.80
64.75
142.30
219.85
297.41
374.96
452.51
530.06
607.61
G
DH
H
EL

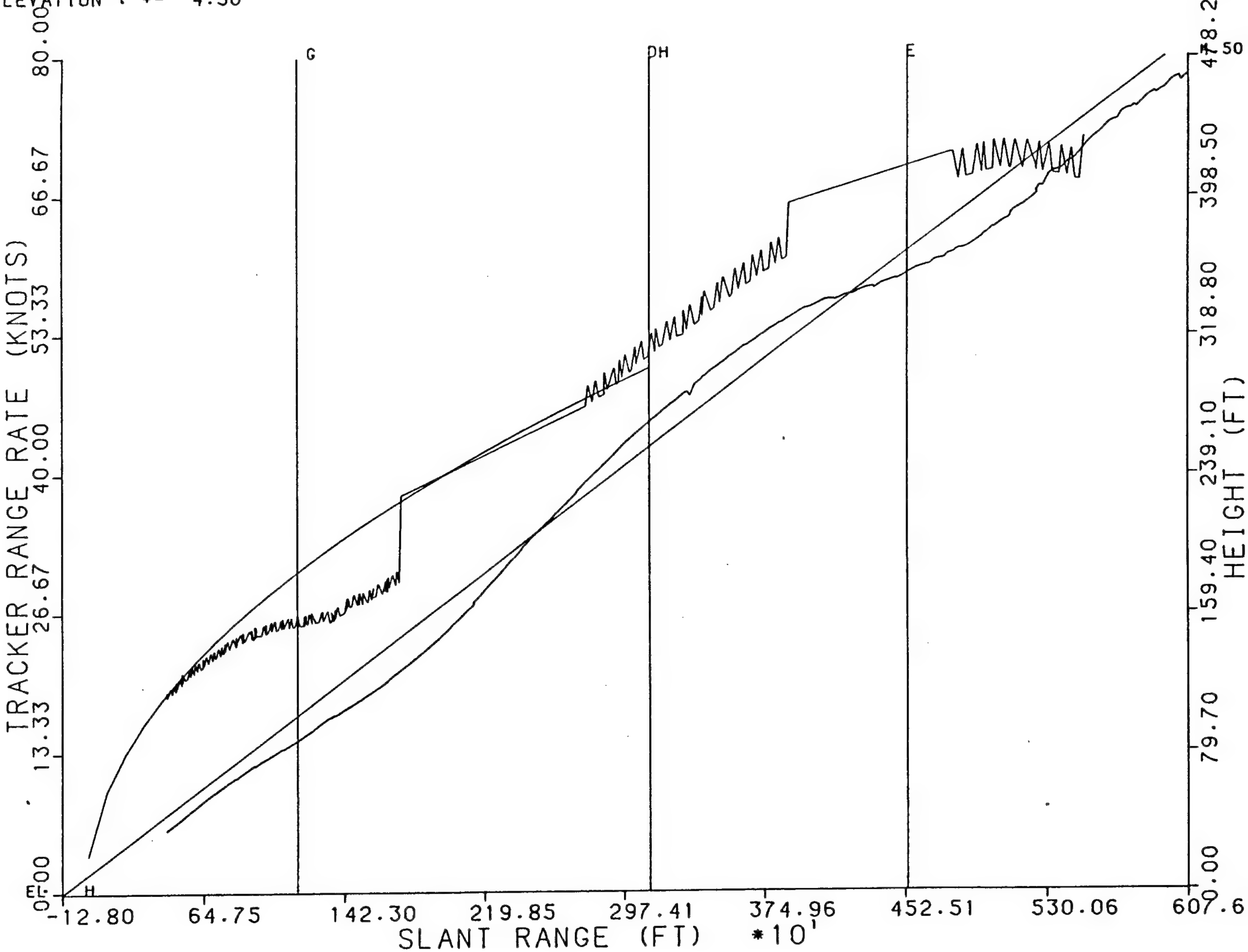
RUN # 4
6/8/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 5 DEGREE L AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



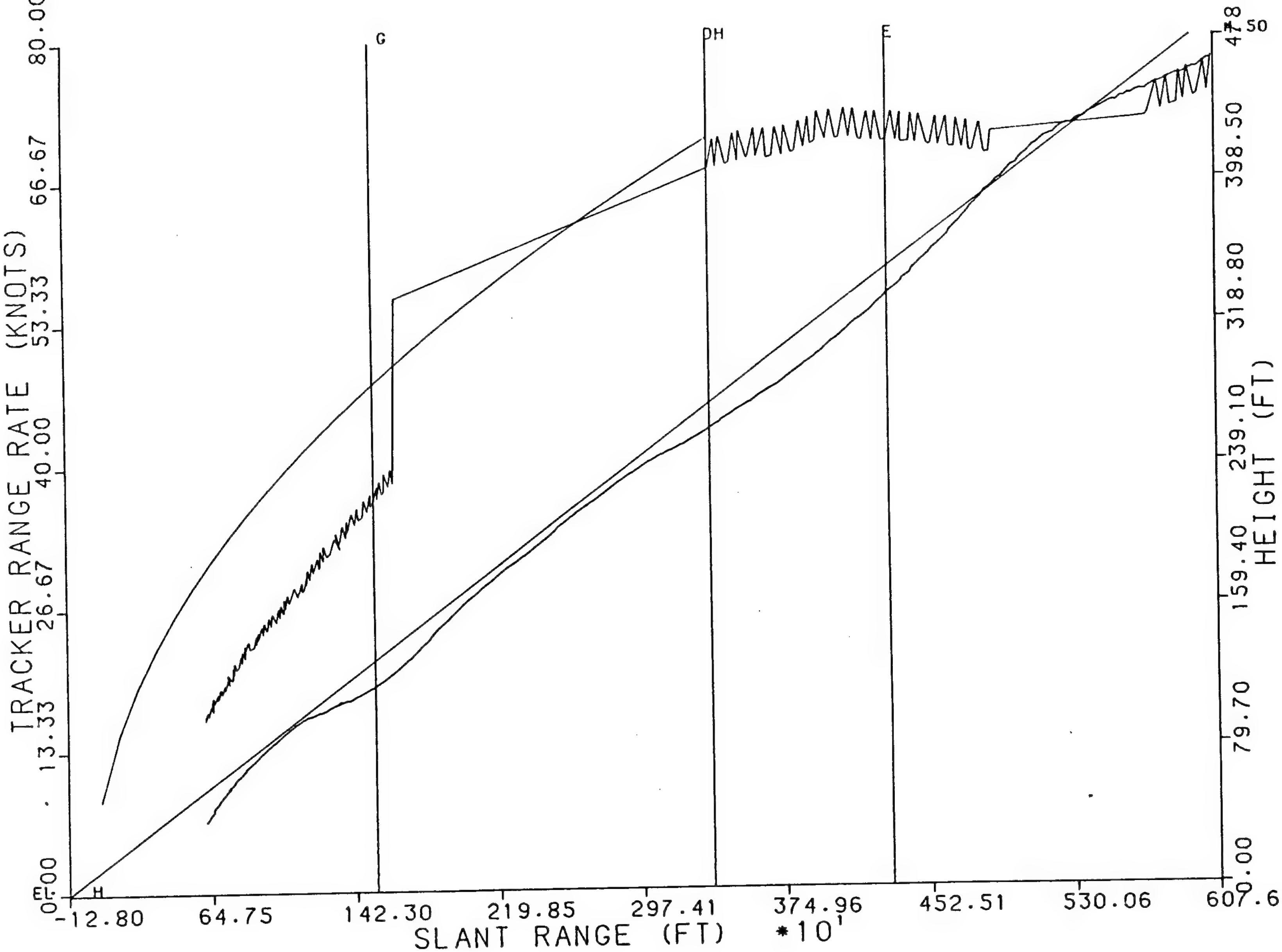
RUN # 5
6/8/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 6
6/8/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE R AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT. N J 08405



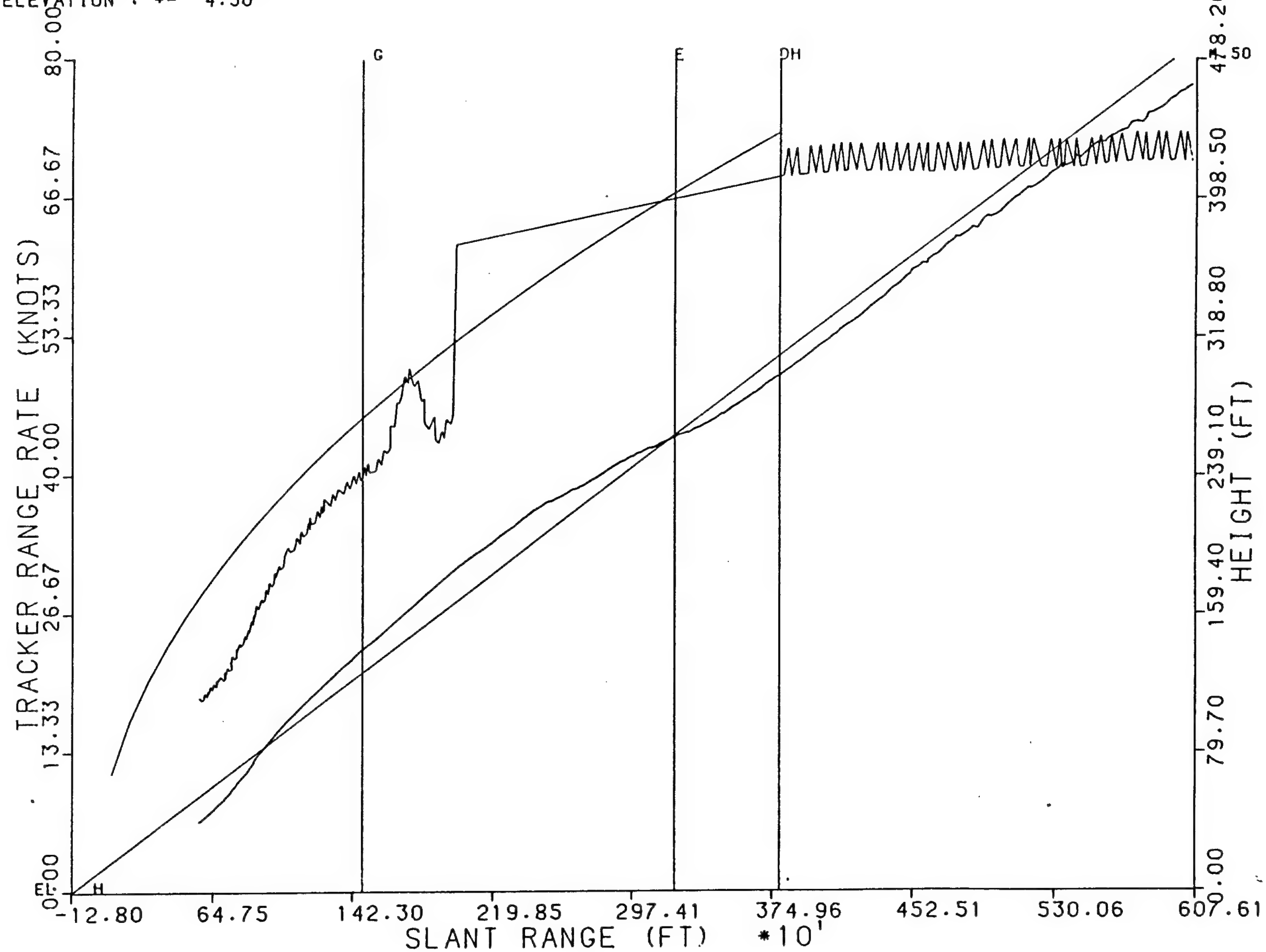
RUN # 7

6/8/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE L AZ ON

AZIMUTH : +- 0.00

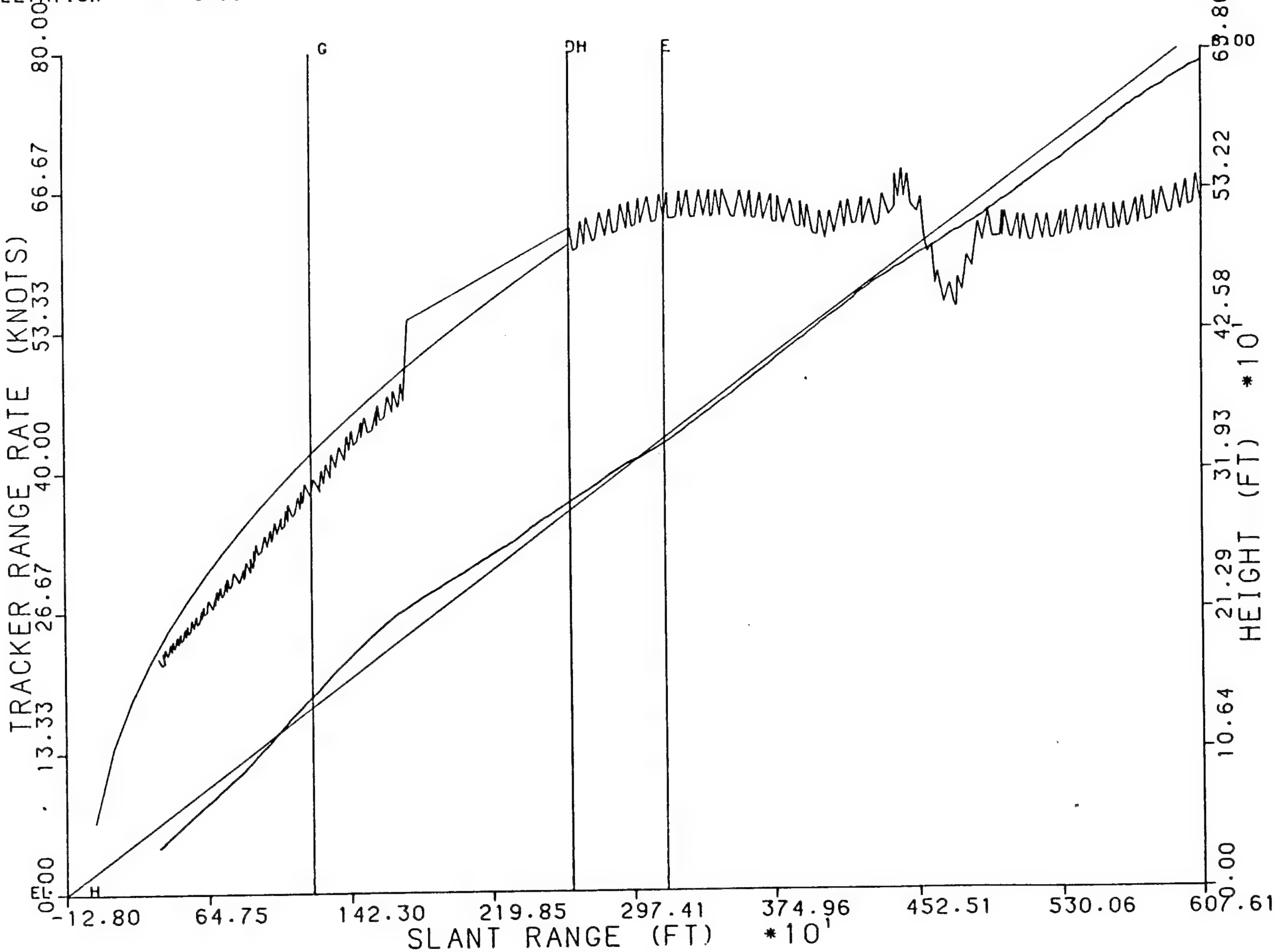
ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT. N J 08405



RUN # 8
6/8/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



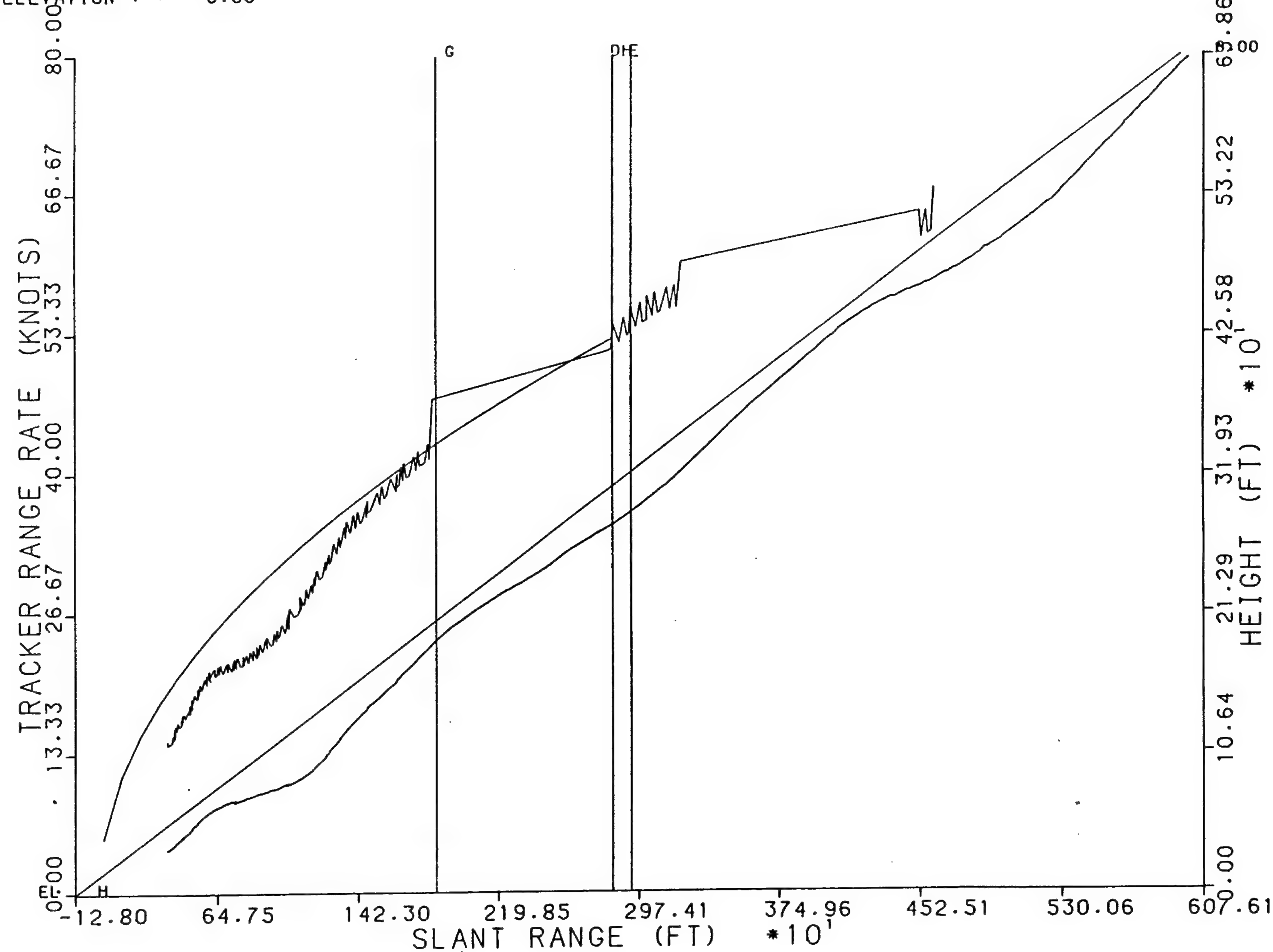
RUN # 9

6/8/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 5 DEGREE R AZ ON

AZIMUTH : +- 0.00

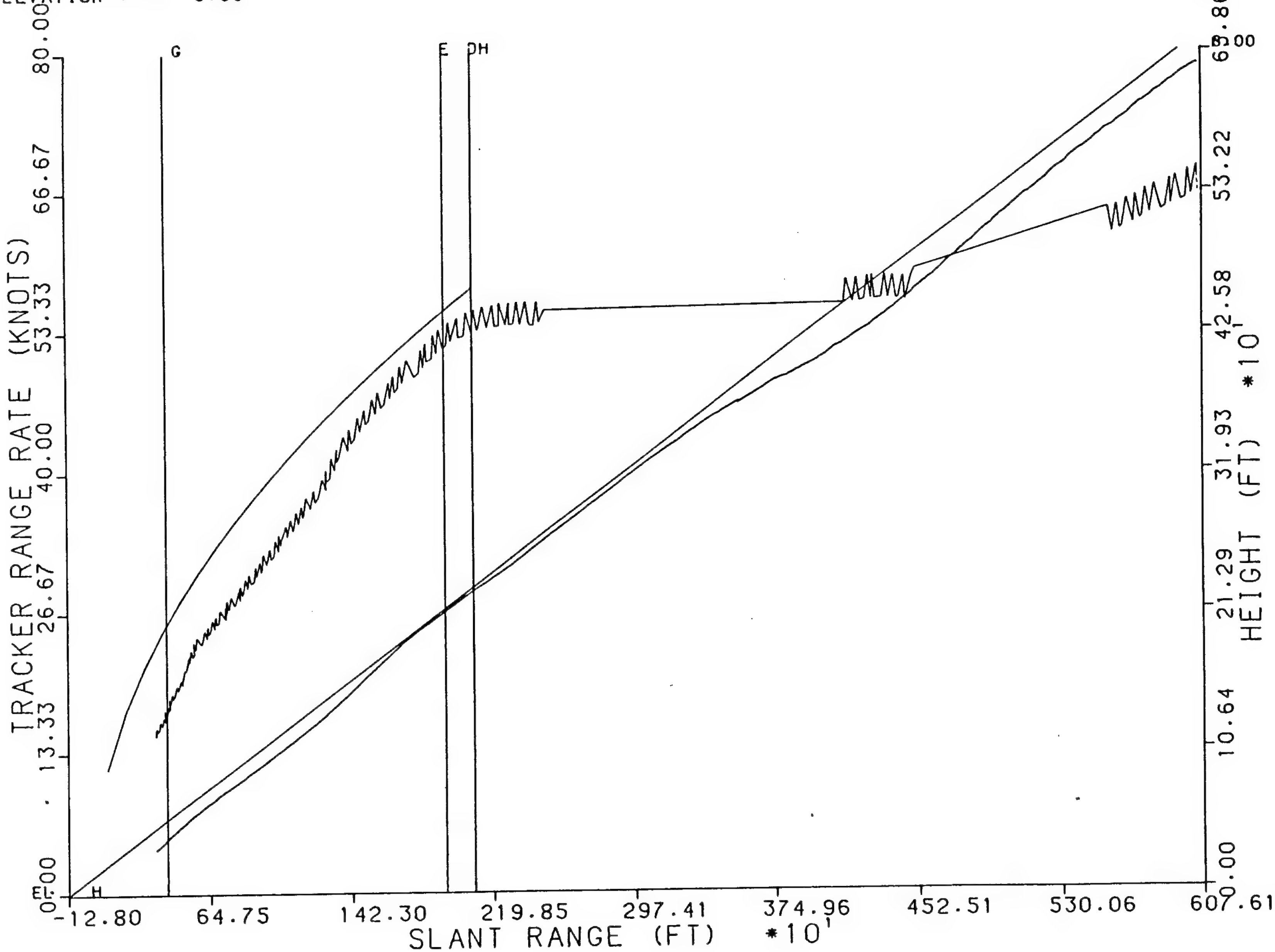
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



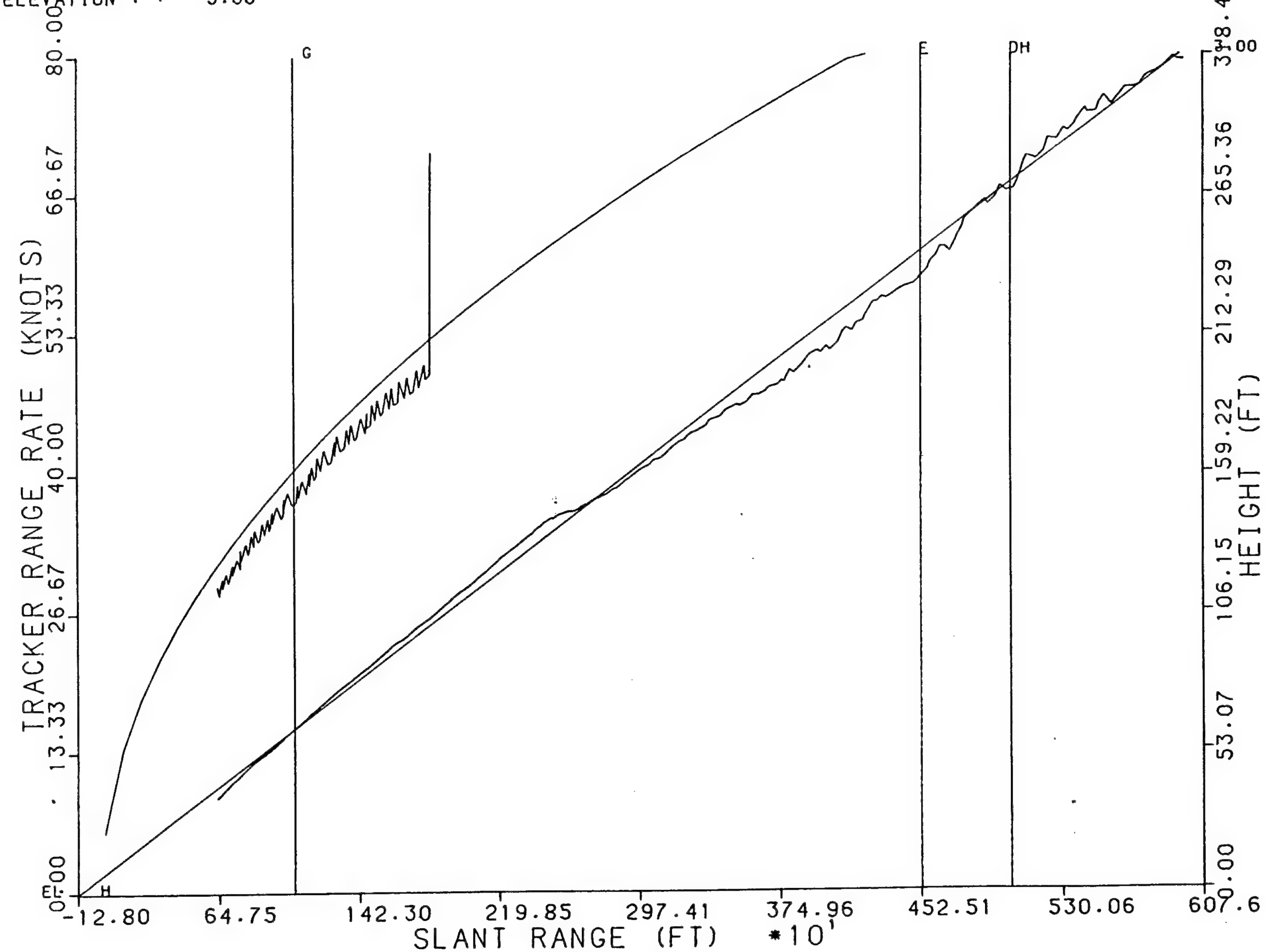
RUN # 10
6/8/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 5 DEGREE L AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



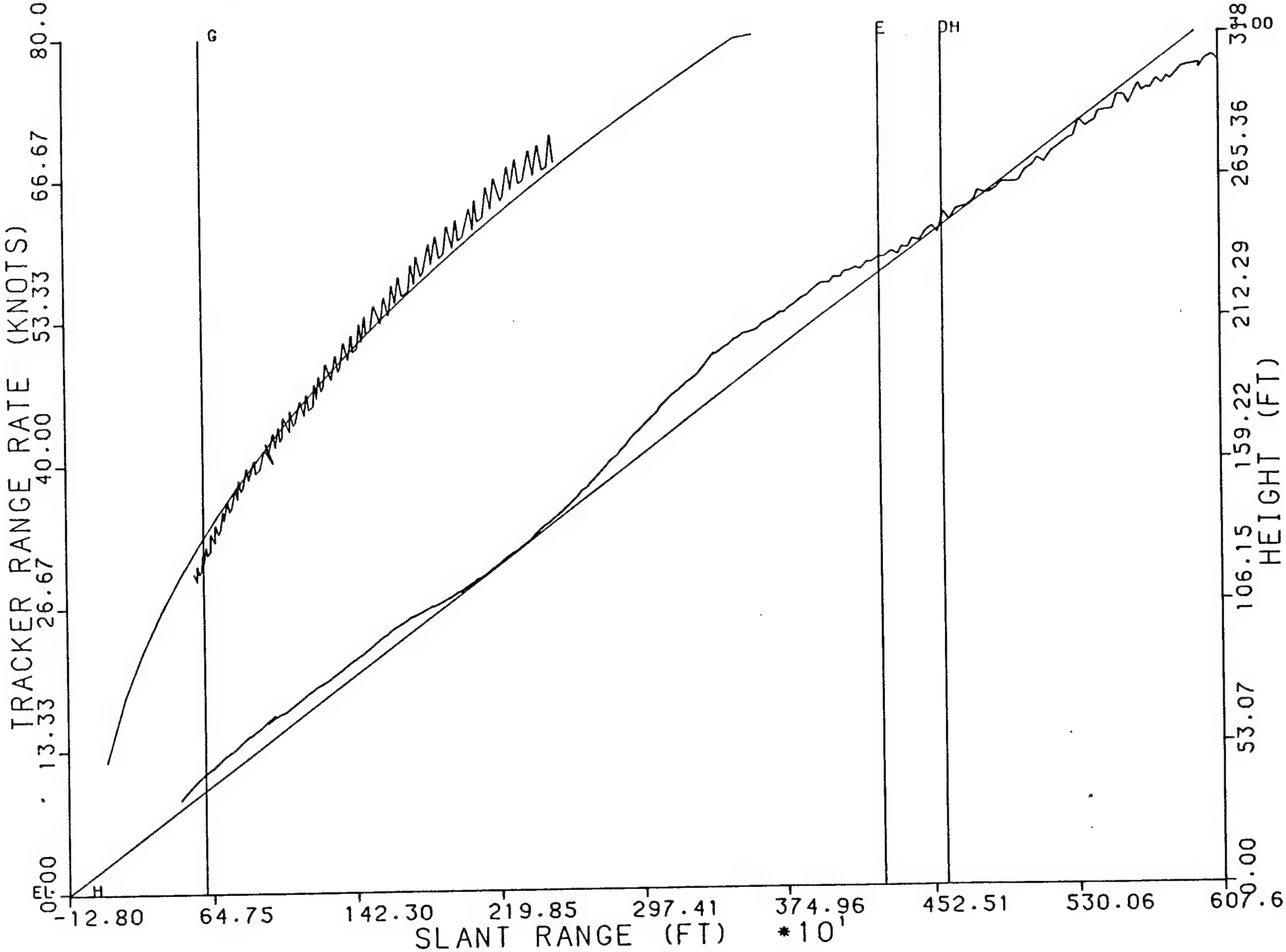
RUN # 1
6/9/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



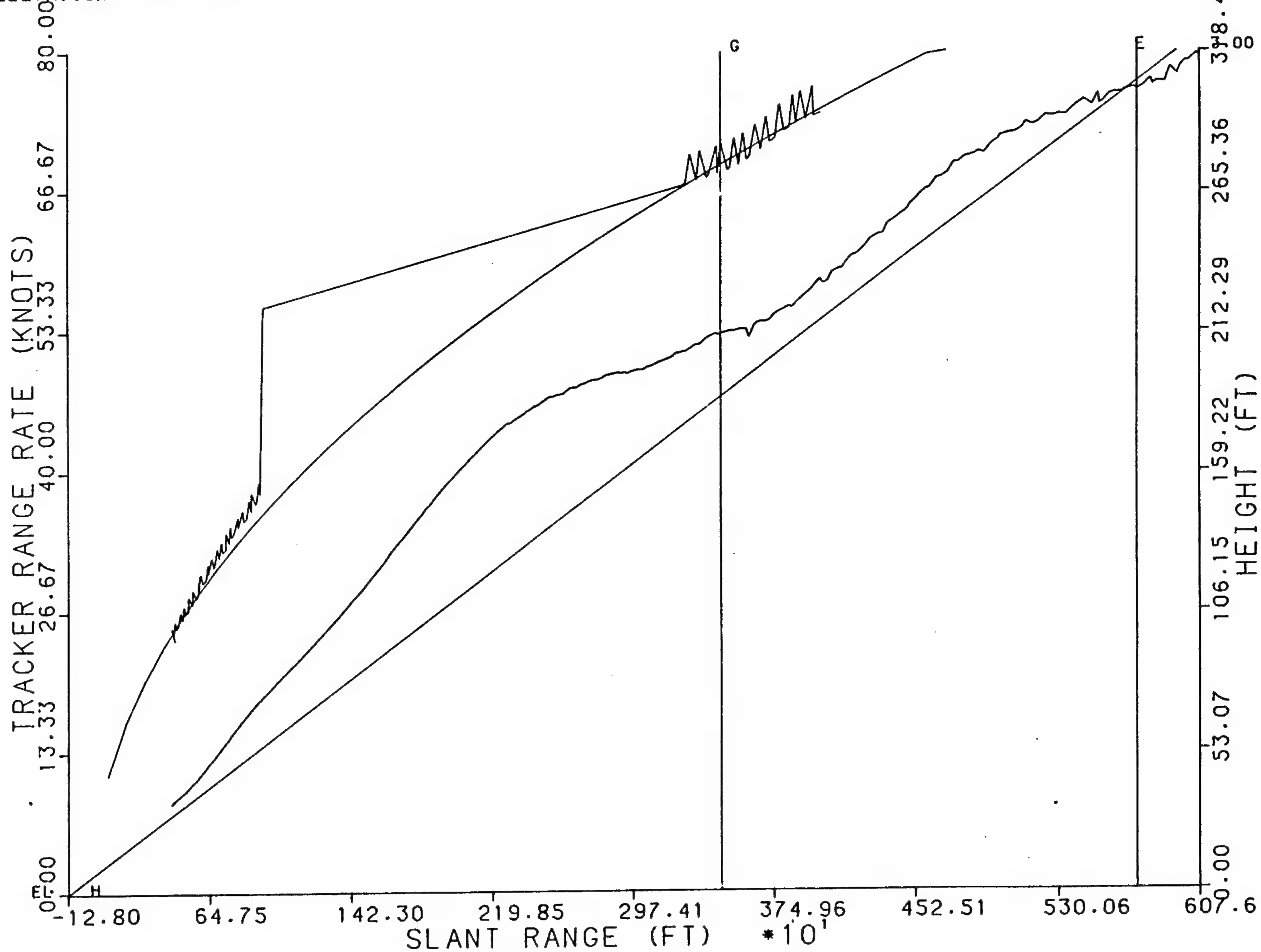
RUN # 2
6/9/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



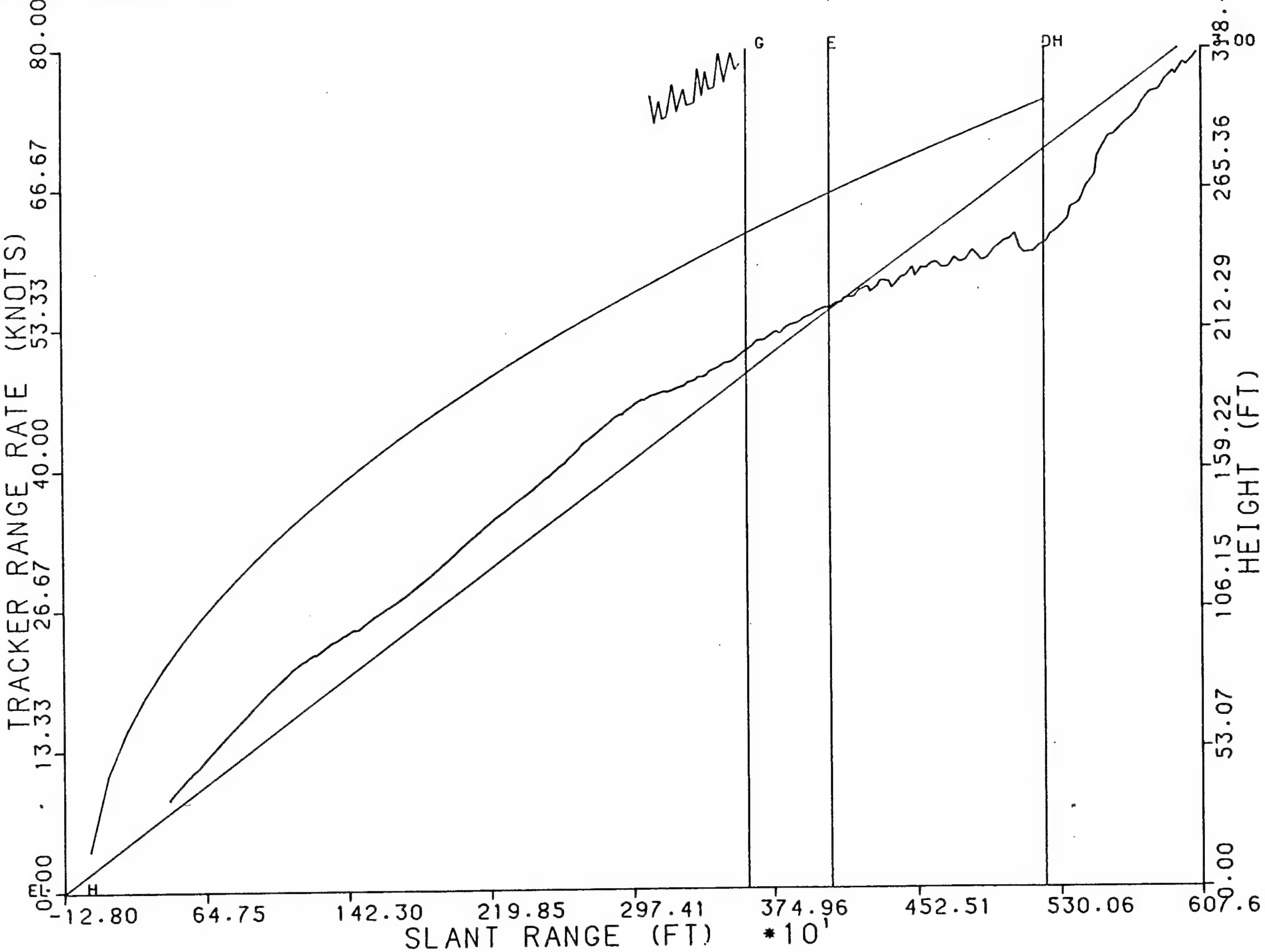
RUN # 3
6/9/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 5 DEGREE R AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 4
6/9/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 5 DEGREE L AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



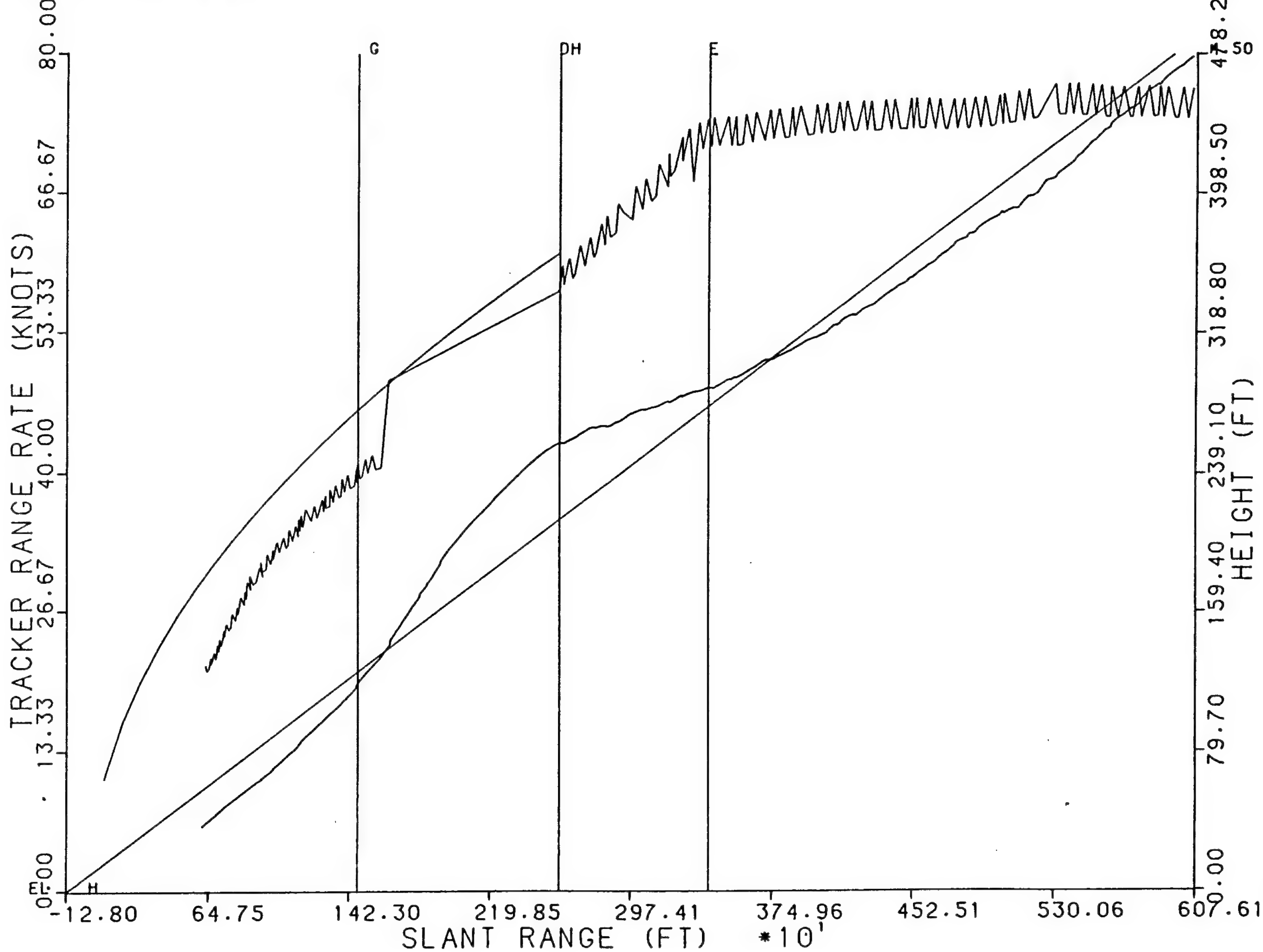
RUN # 5

6/9/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 0 DEGREE AZ ON

AZIMUTH : +- 0.00

ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT. N J 08405



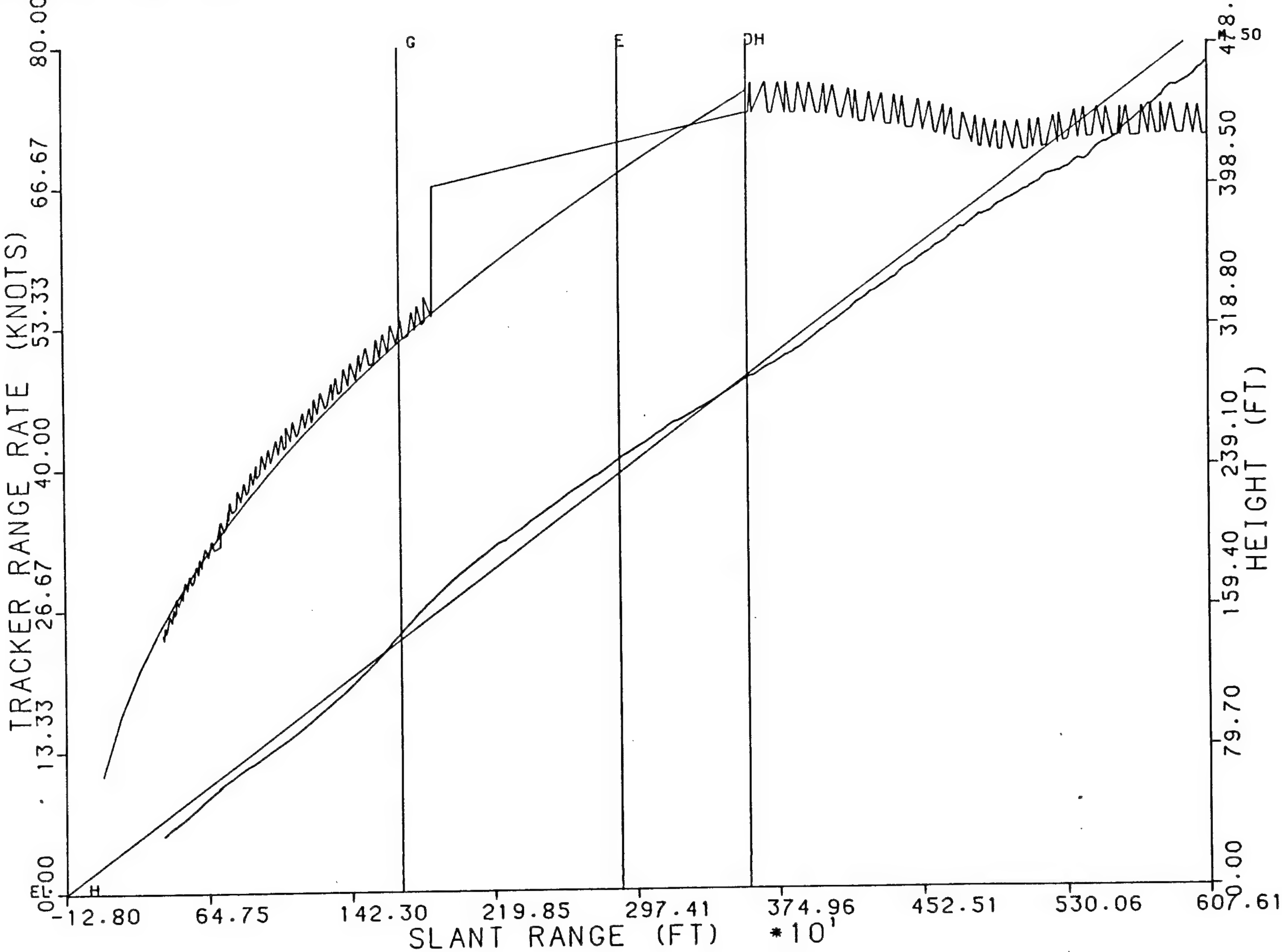
RUN # 6

6/9/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE R AZ OFF

AZIMUTH : +- 0.00

ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT. N J 08405



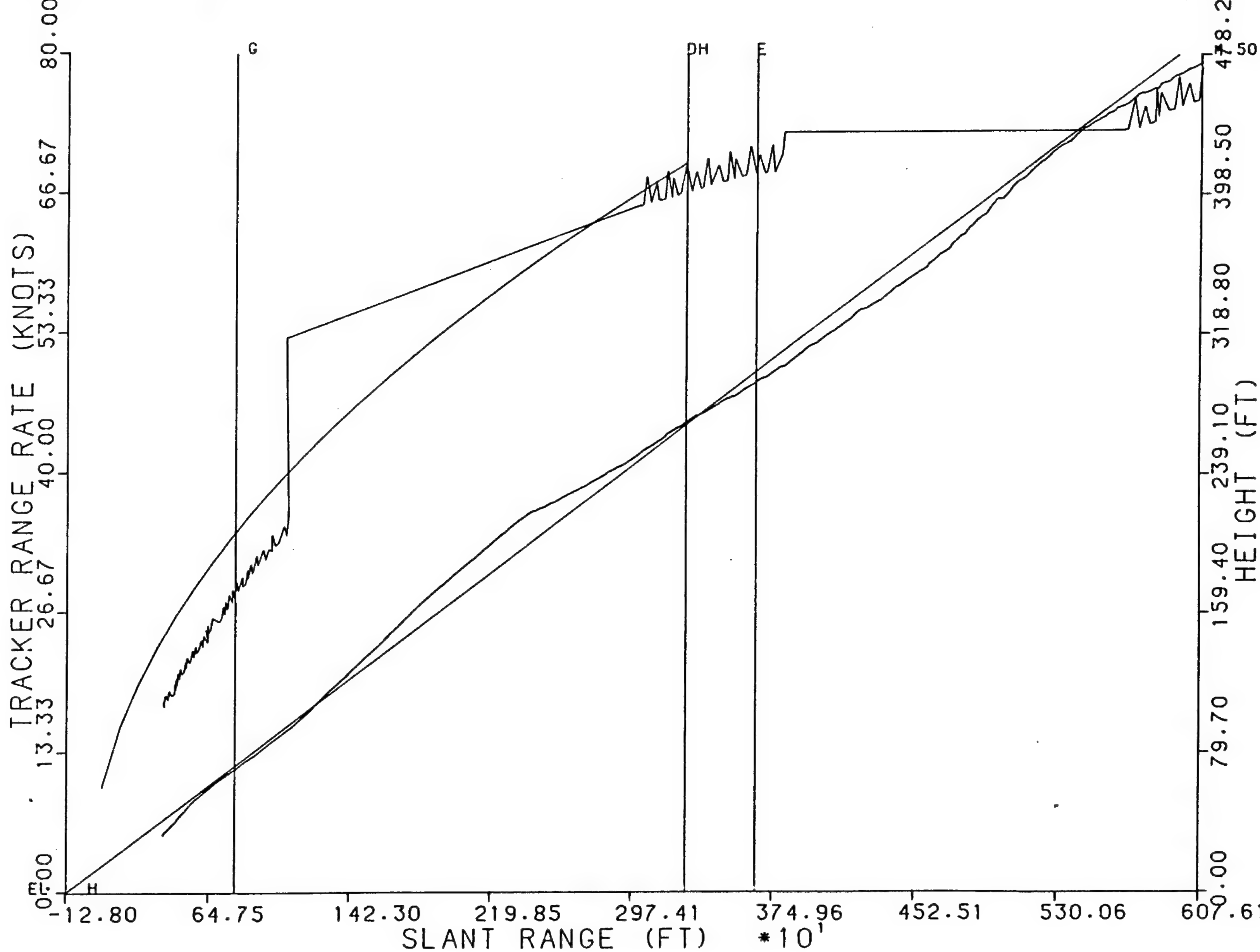
RUN # 7

6/9/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE L AZ ON

AZIMUTH : +- 0.00

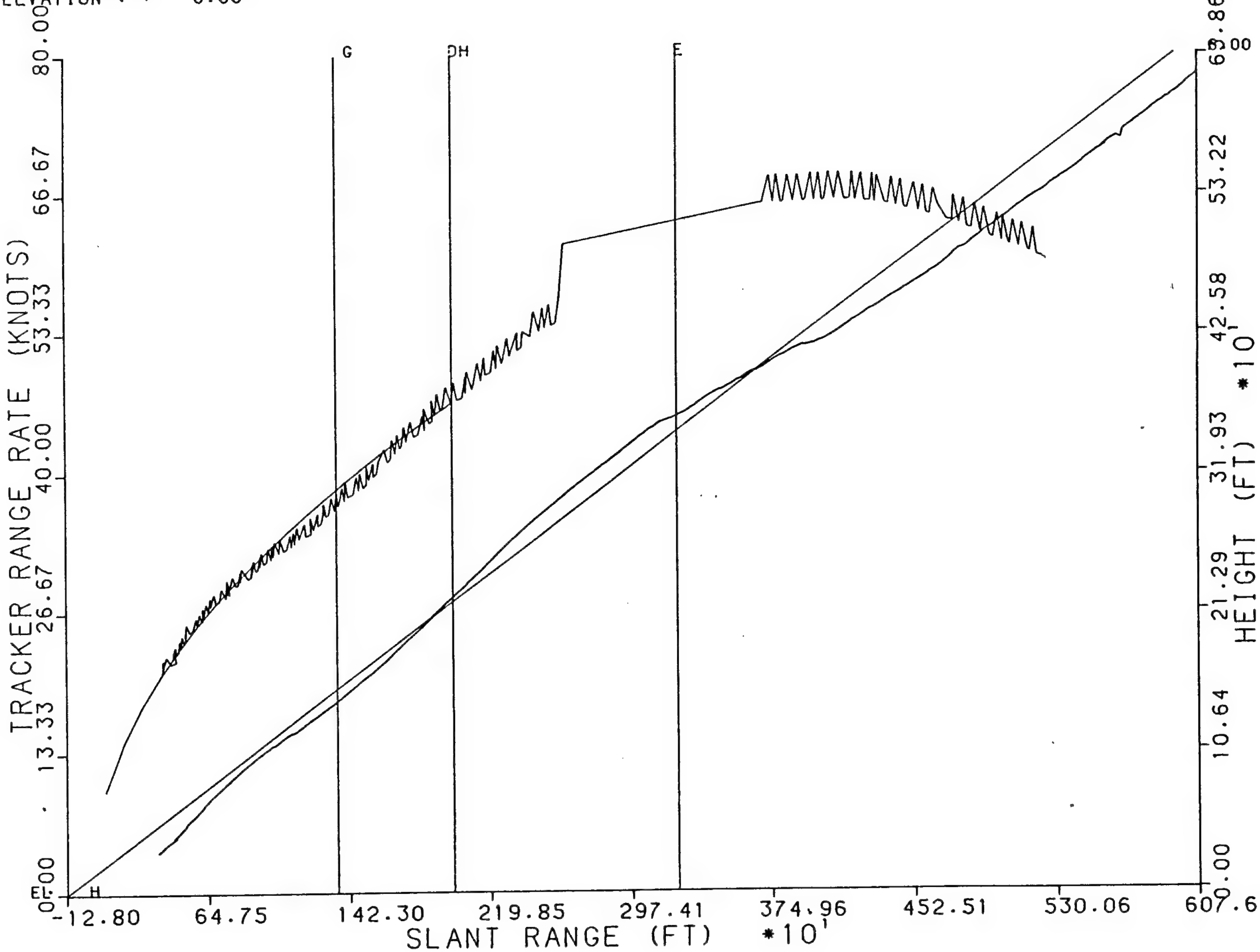
ELEVATION : +- 4.50

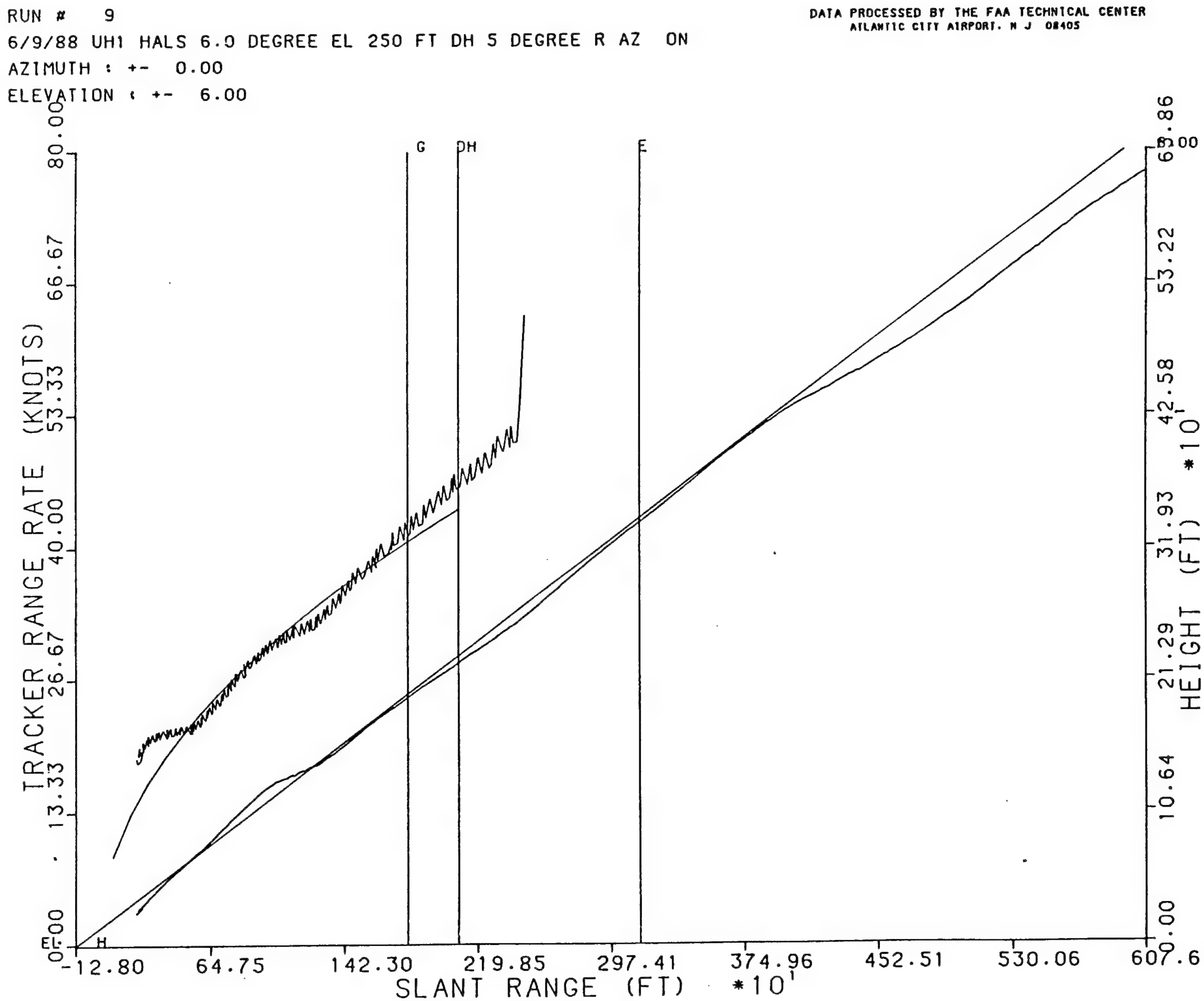
DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 8
6/9/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405

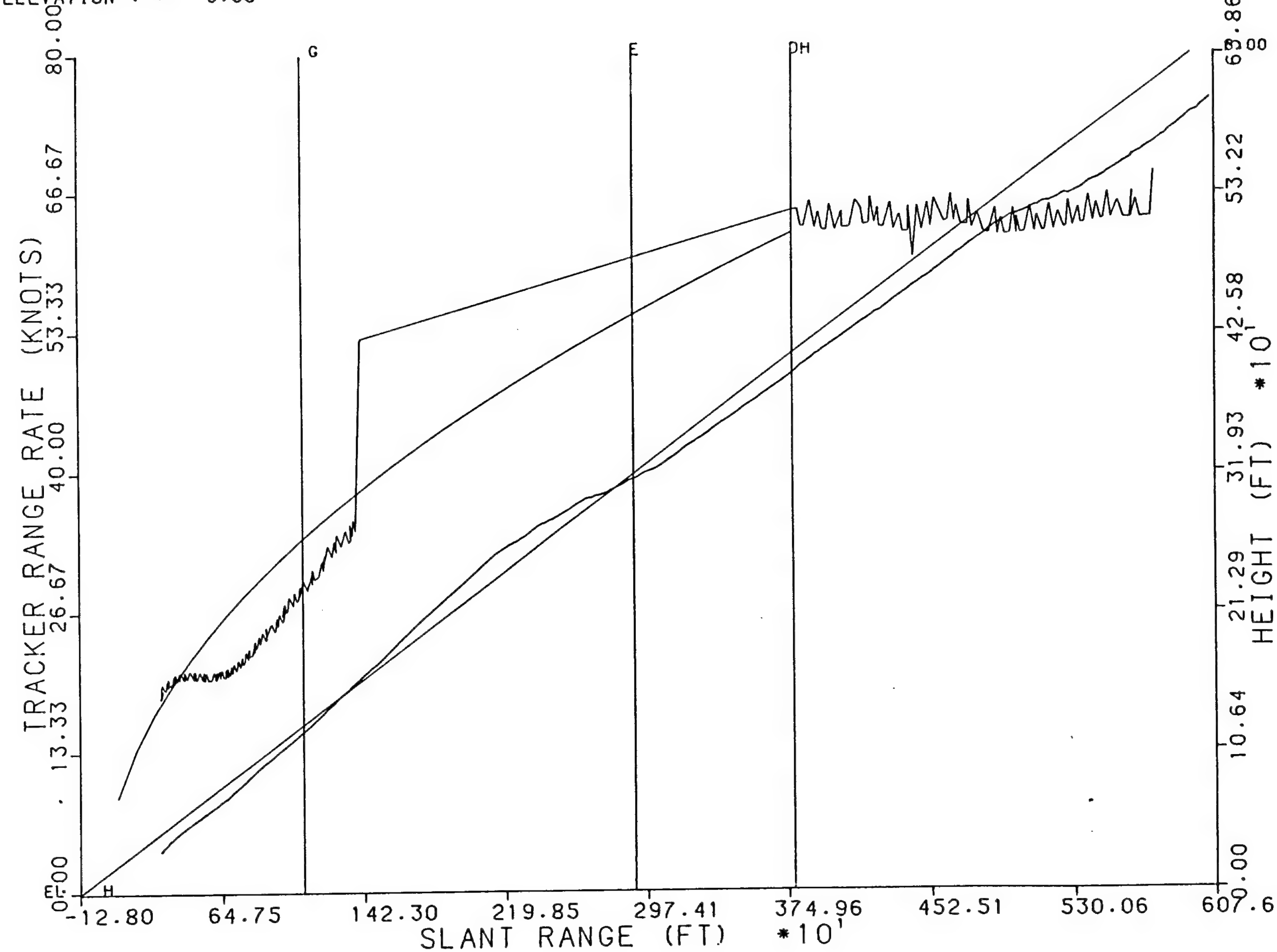




RUN # 9
6/9/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 5 DEGREE R AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 6.00
DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405
TRACKER RANGE RATE (KNOTS)
0.00
13.33
26.67
40.00
53.33
66.67
80.00
HEIGHT (FT) *10[1]
0.00
10.64
21.29
31.93
42.58
53.22
63.86
SLANT RANGE (FT) *10[1]
-12.80
64.75
142.30
219.85
297.41
374.96
452.51
530.06
607.61
G
DH
E
H
EL

RUN # 10
6/9/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 5 DEGREE L AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



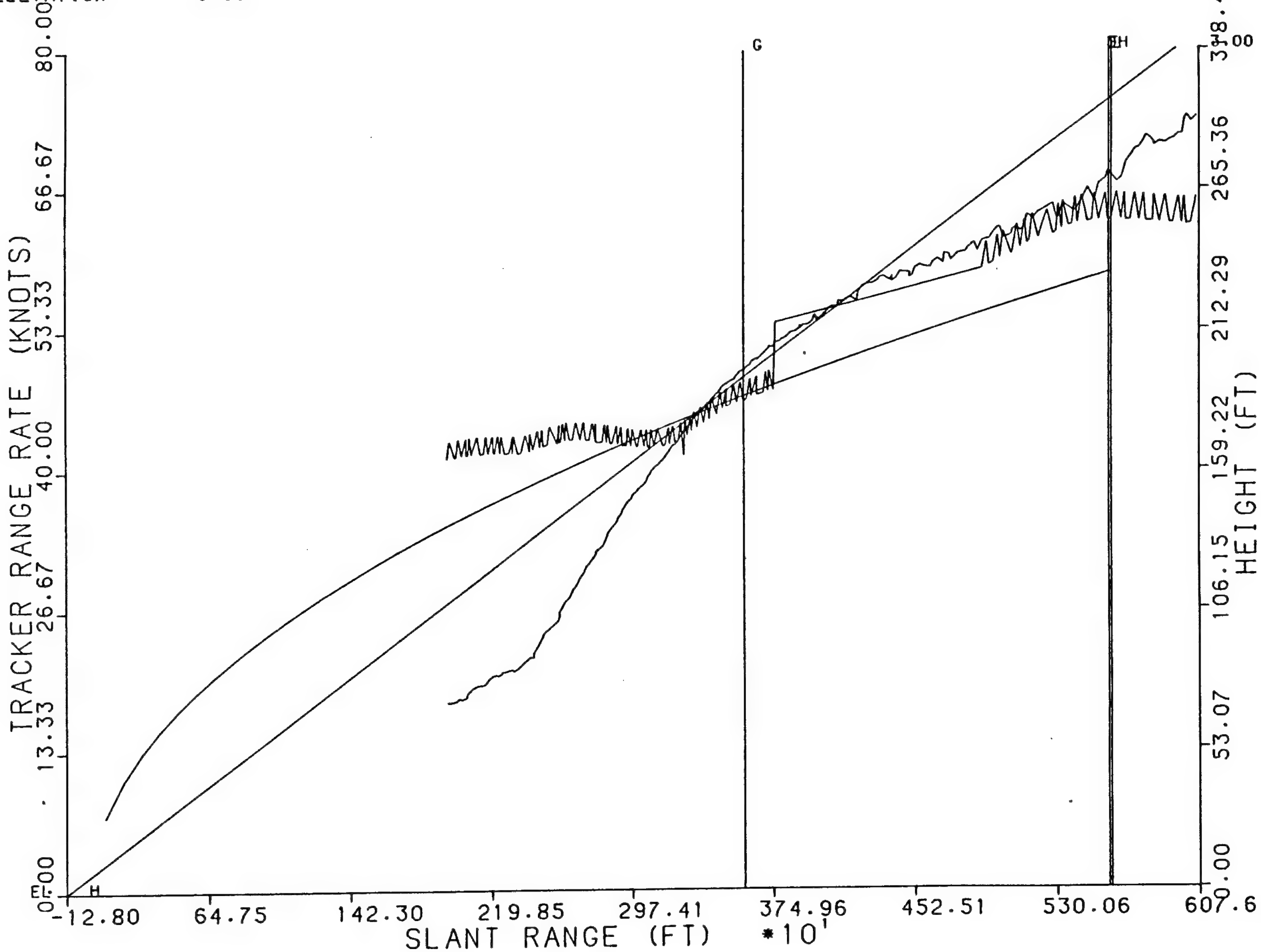
RUN # 1

6/22/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ ON

AZIMUTH : +- 0.00

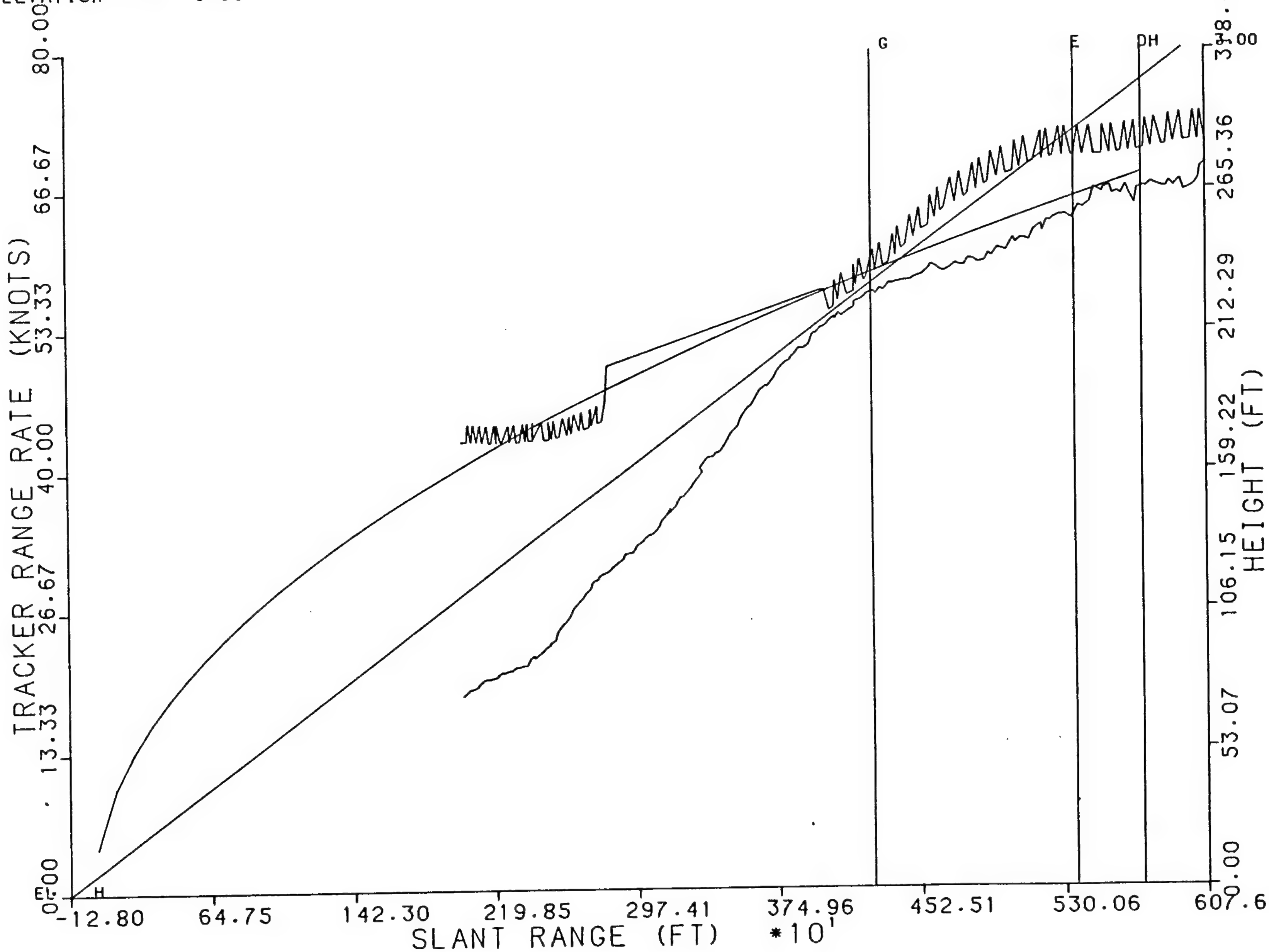
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT. N J 08405



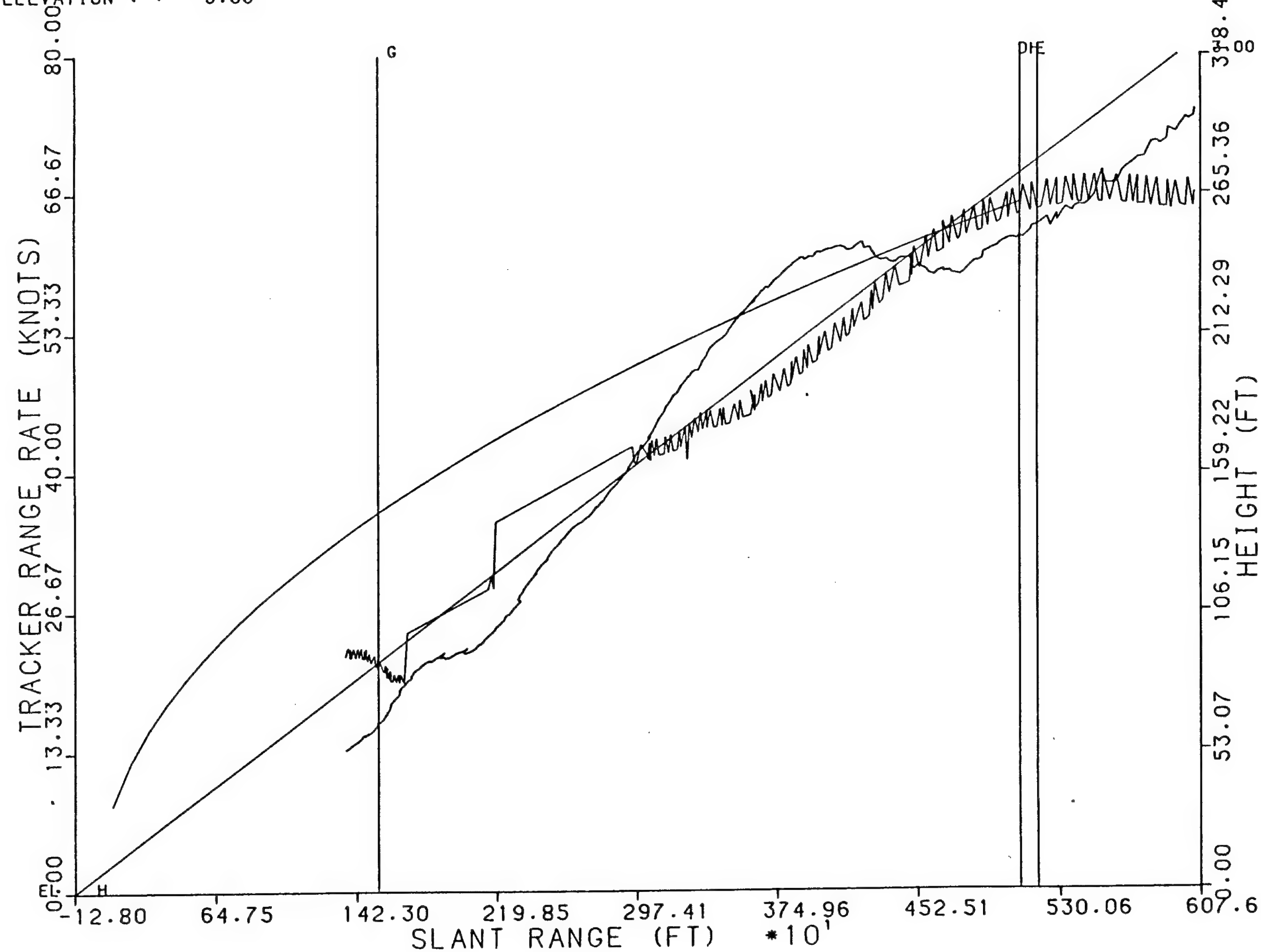
RUN # 2
6/22/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 3
6/22/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 5 DEGREE R AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



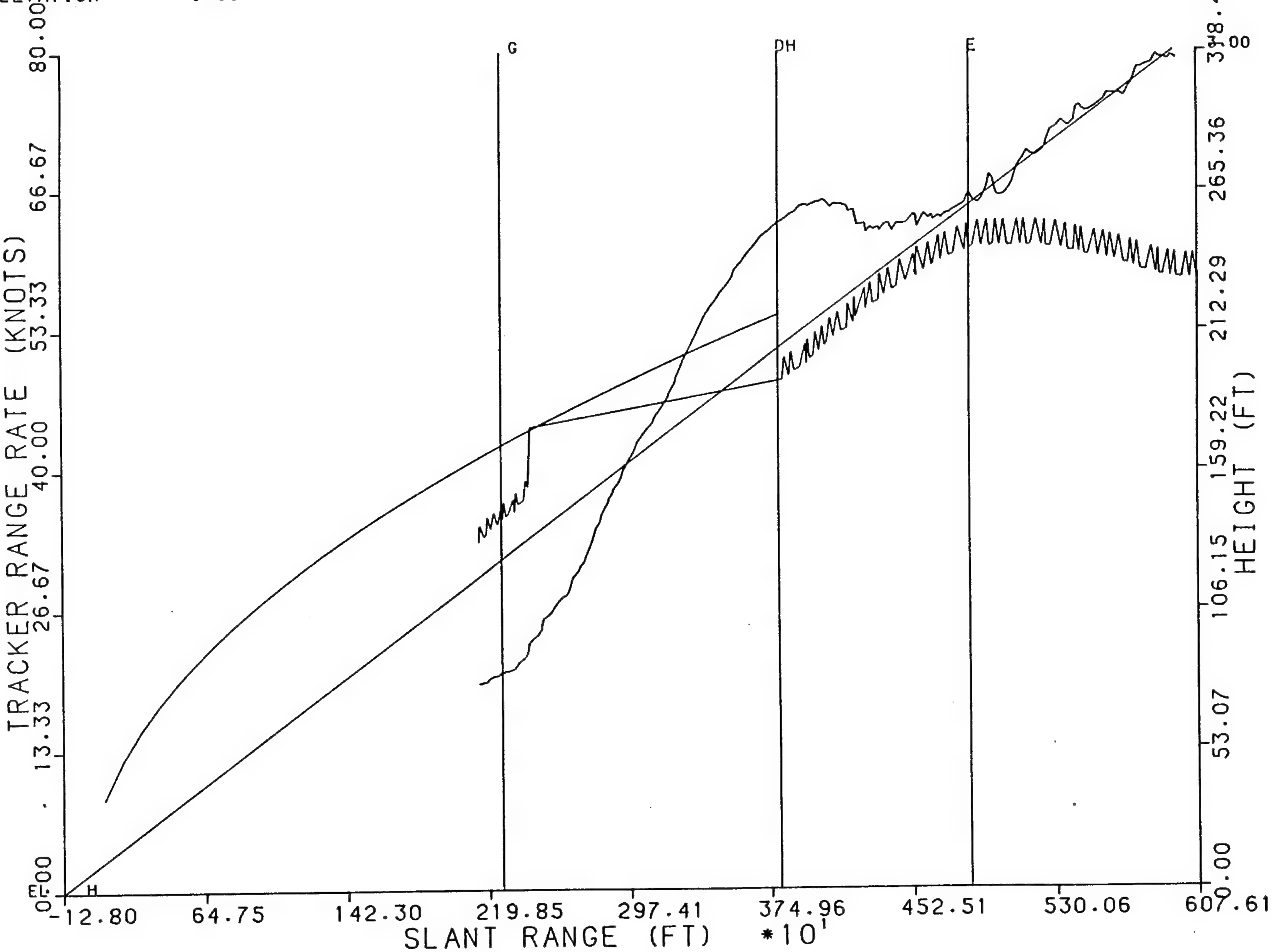
RUN # 4

6/22/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 5 DEGREE L AZ OFF

AZIMUTH : +- 0.00

ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



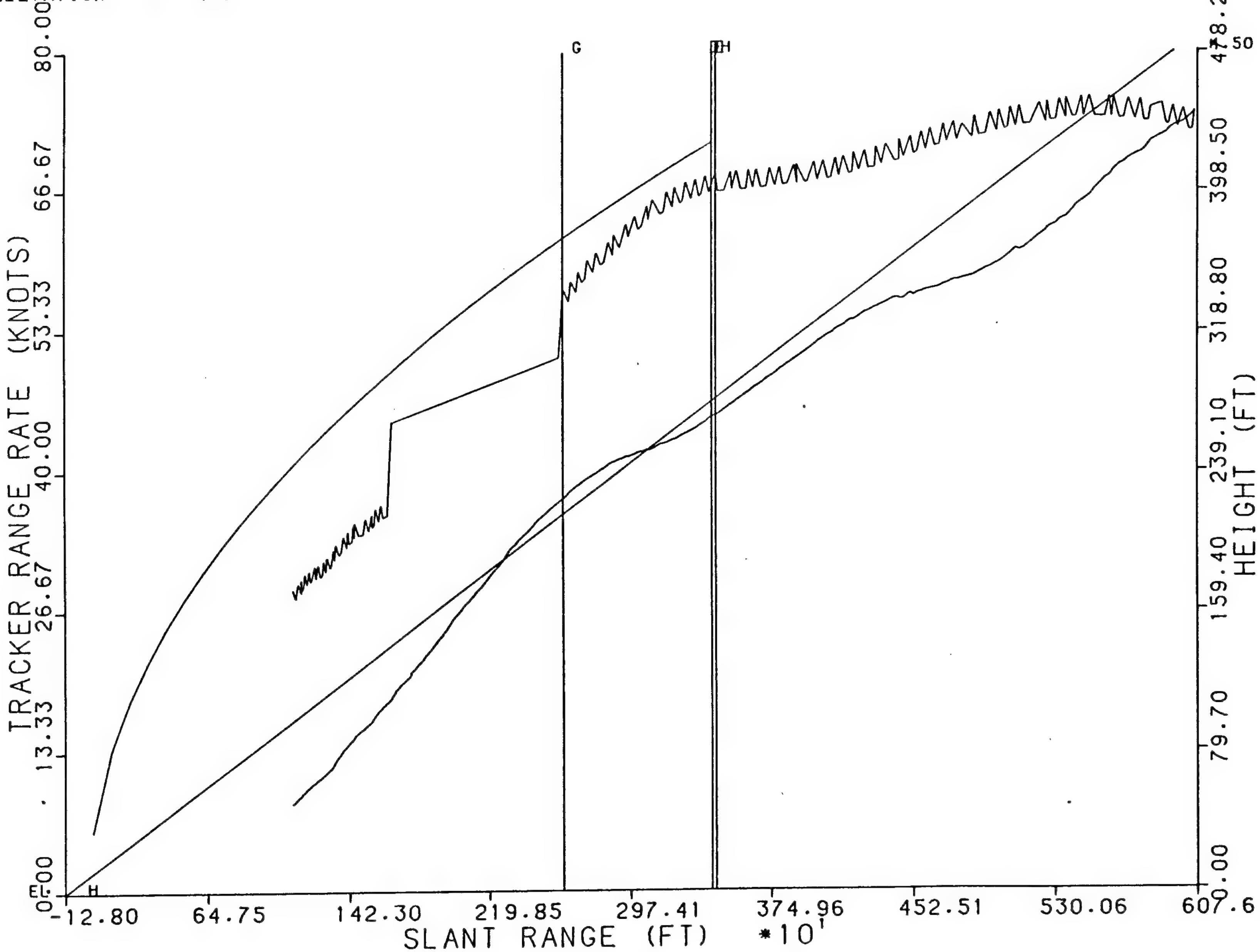
RUN # 5

6/22/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 0 DEGREE AZ ON

AZIMUTH : +- 0.00

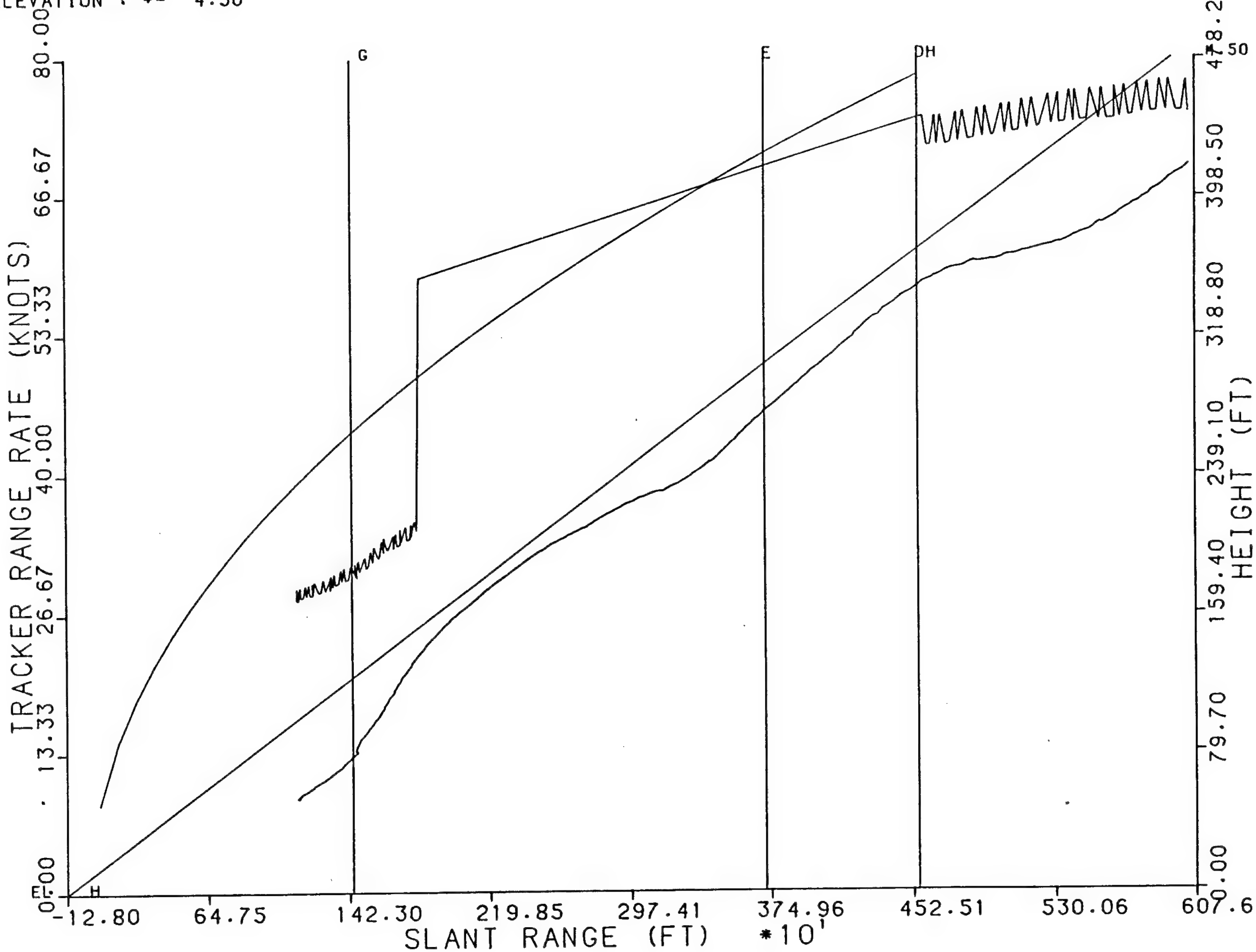
ELEVATION : +- 4.50

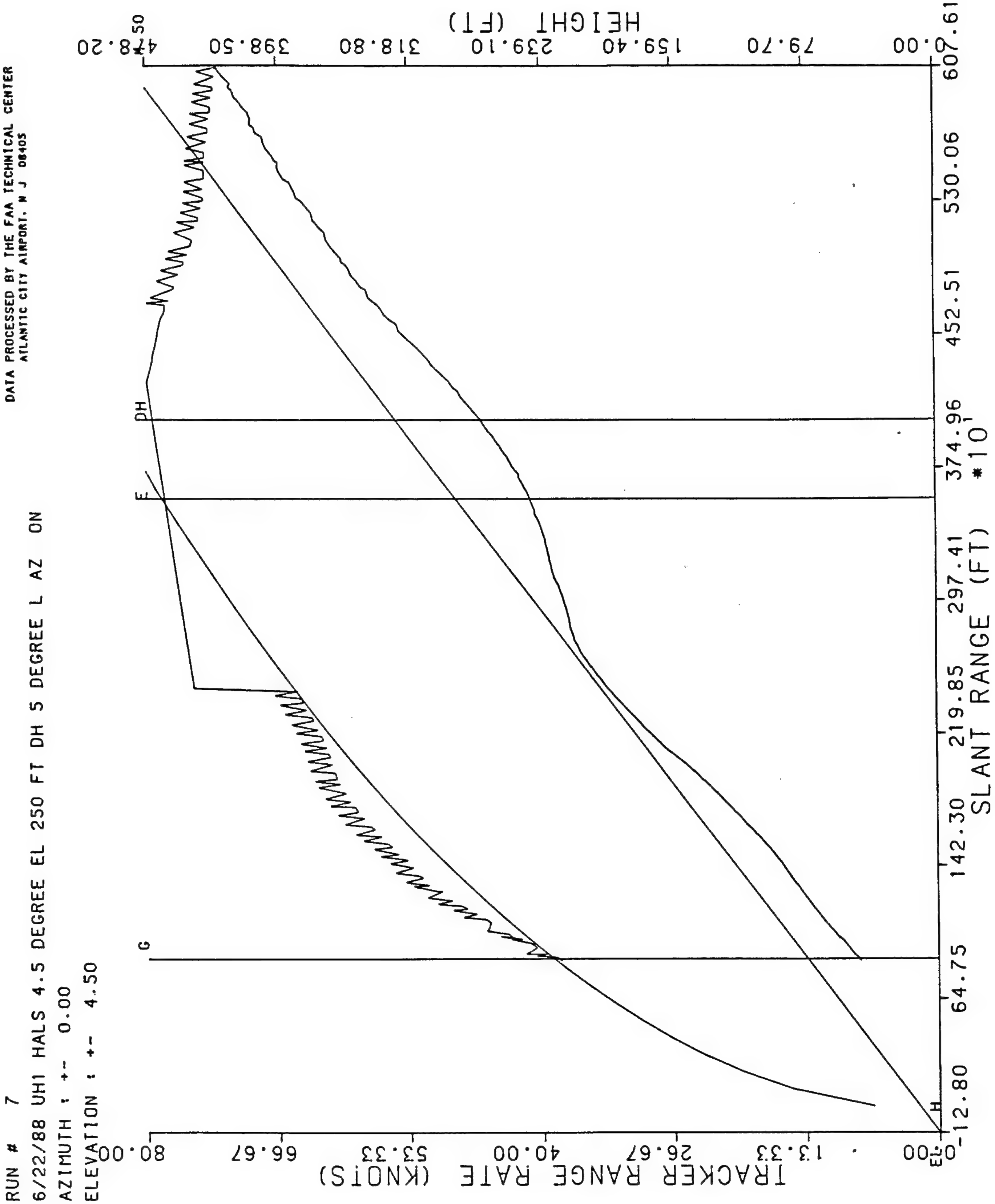
DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 6
6/22/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE R AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

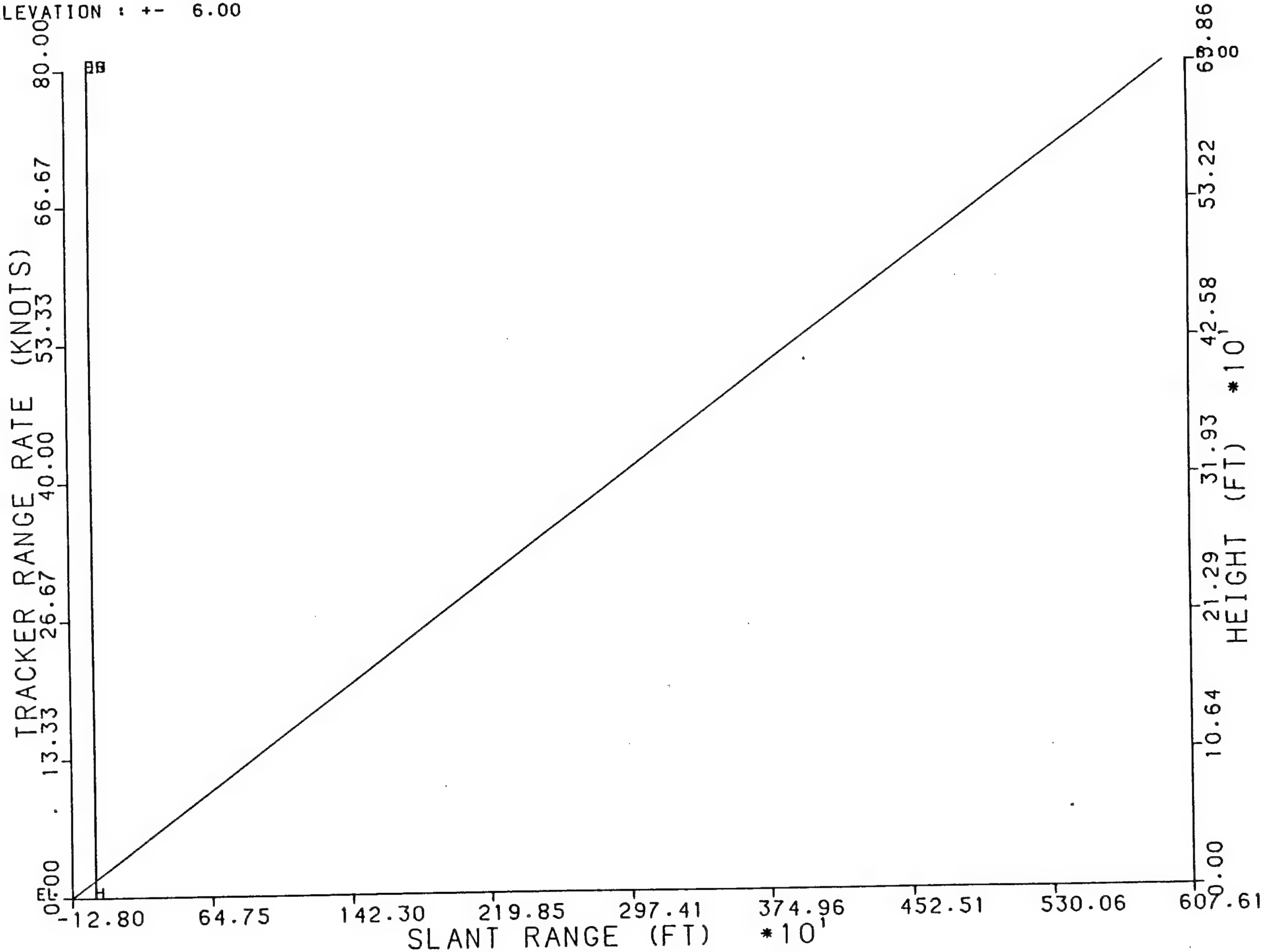
DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT. N J 08405




RUN # 7
6/22/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE L AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 4.50
DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405
TRACKER RANGE RATE (KNOTS)
HEIGHT (FT)
SLANT RANGE (FT) *10[1]
0.00
13.33
26.67
40.00
53.33
66.67
80.00
79.70
159.40
239.10
318.80
398.50
478.20
-12.80
64.75
142.30
219.85
297.41
374.96
452.51
530.06
607.61
H
G
E
DH

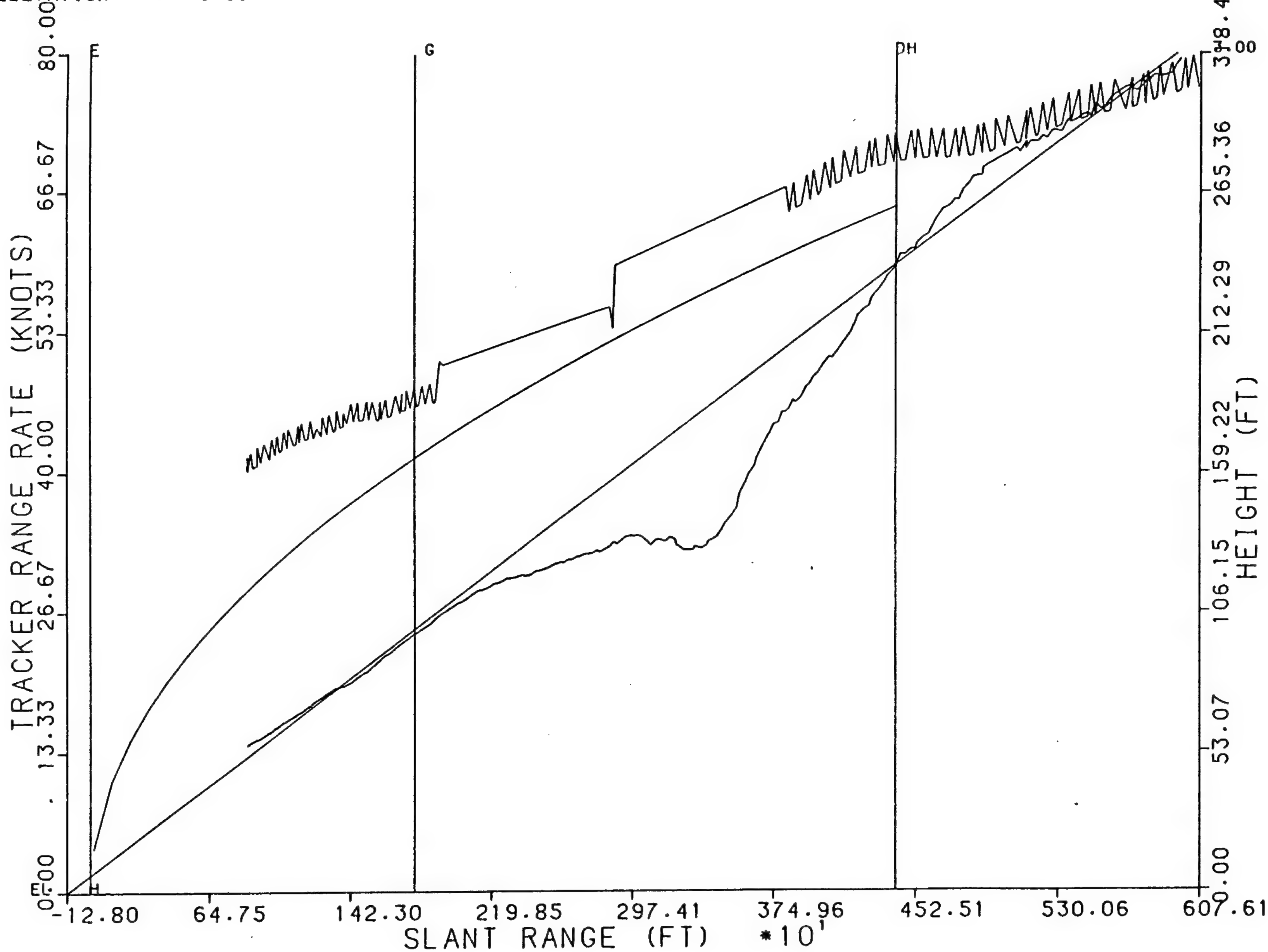
RUN # 8
6/22/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



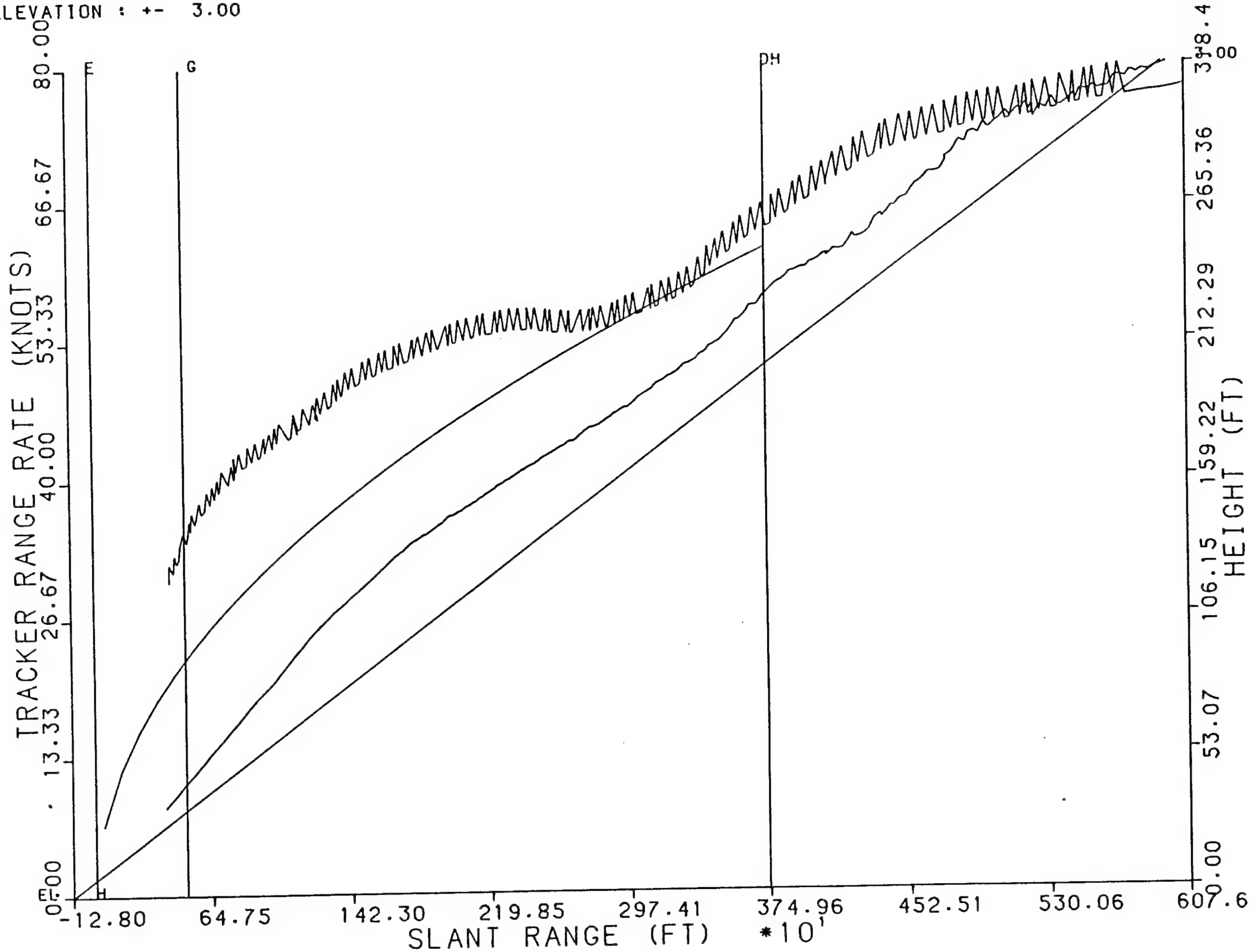
RUN # 1
6/28/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 2
6/28/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



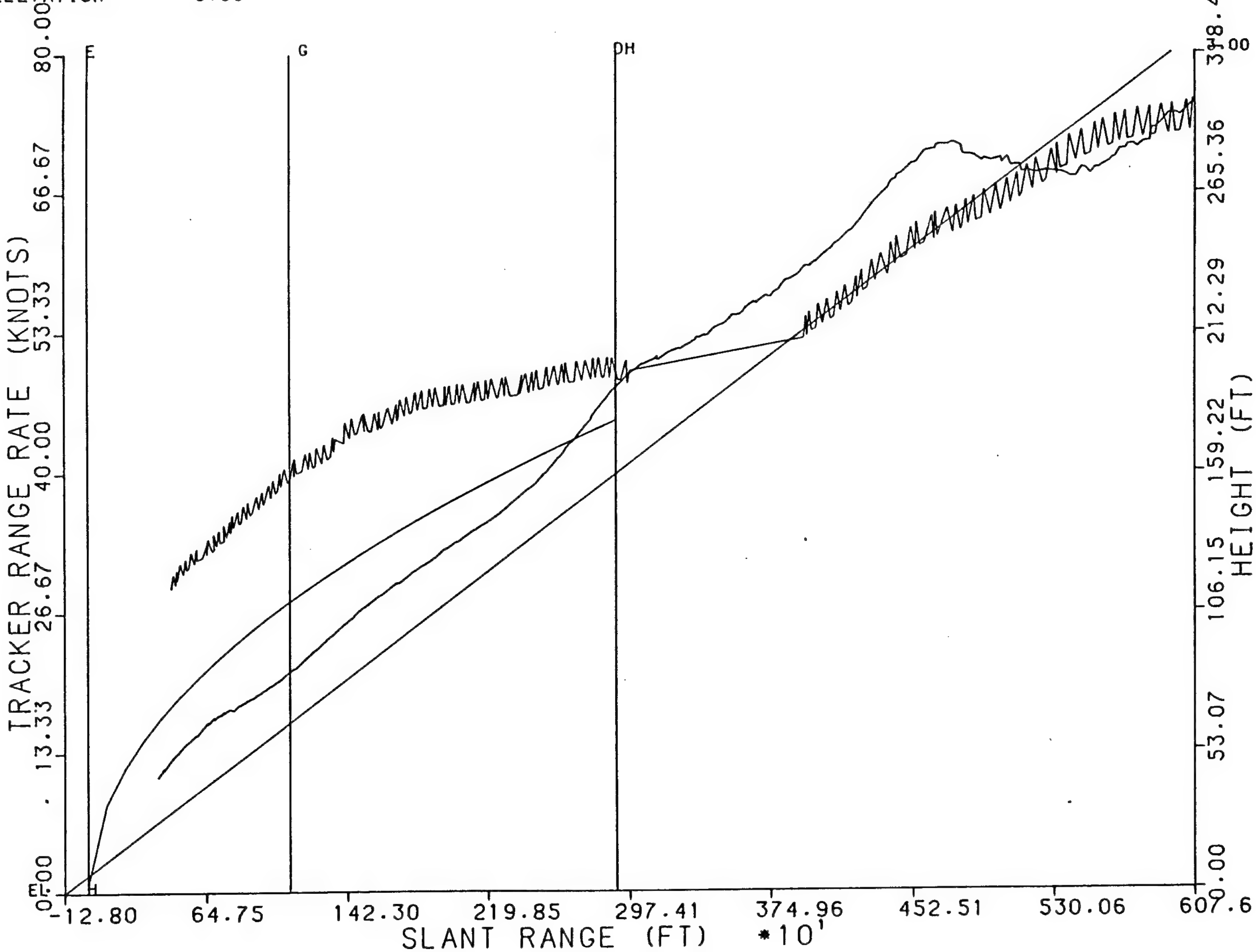
RUN # 3

6/28/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 5 DEGREE R AZ ON

AZIMUTH : +- 0.00

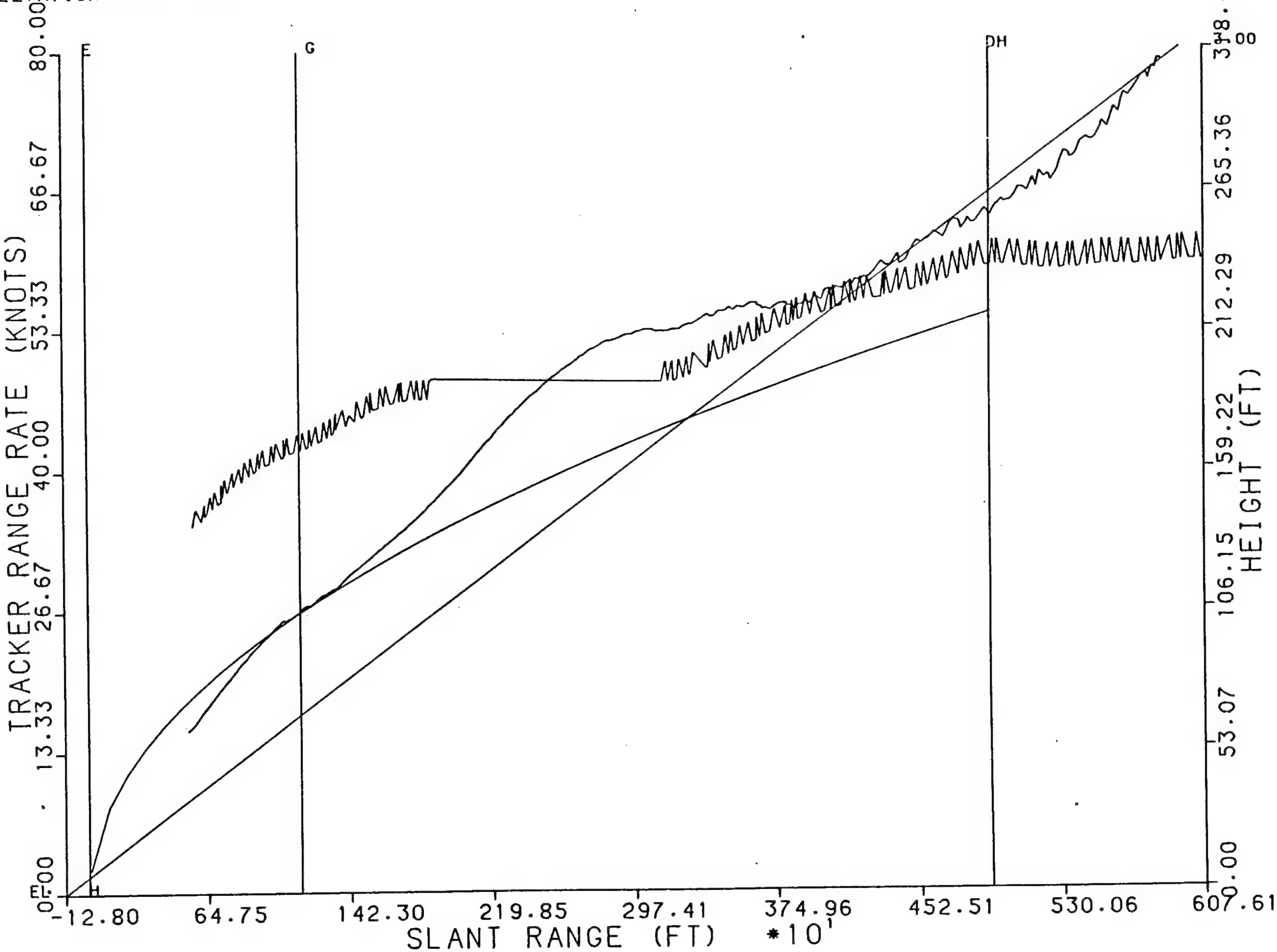
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 4
6/28/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 5 DEGREE L AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N J 08405



RUN # 5

6/28/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 0 DEGREE AZ ON

AZIMUTH : +- 0.00

ELEVATION : +- 4.50

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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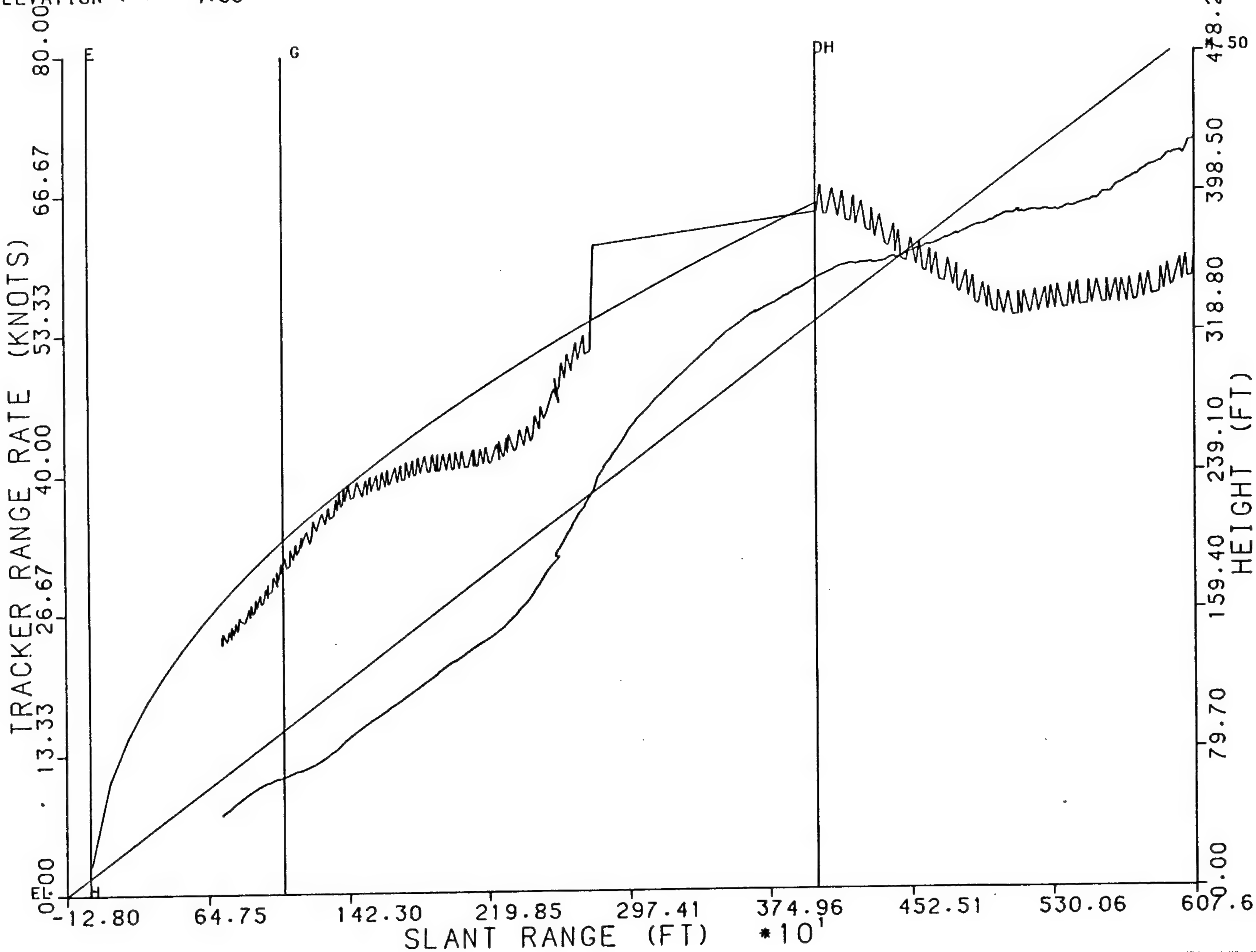

RUN # 6

6/28/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE R AZ OFF

AZIMUTH : +- 0.00

ELEVATION : +- 4.50

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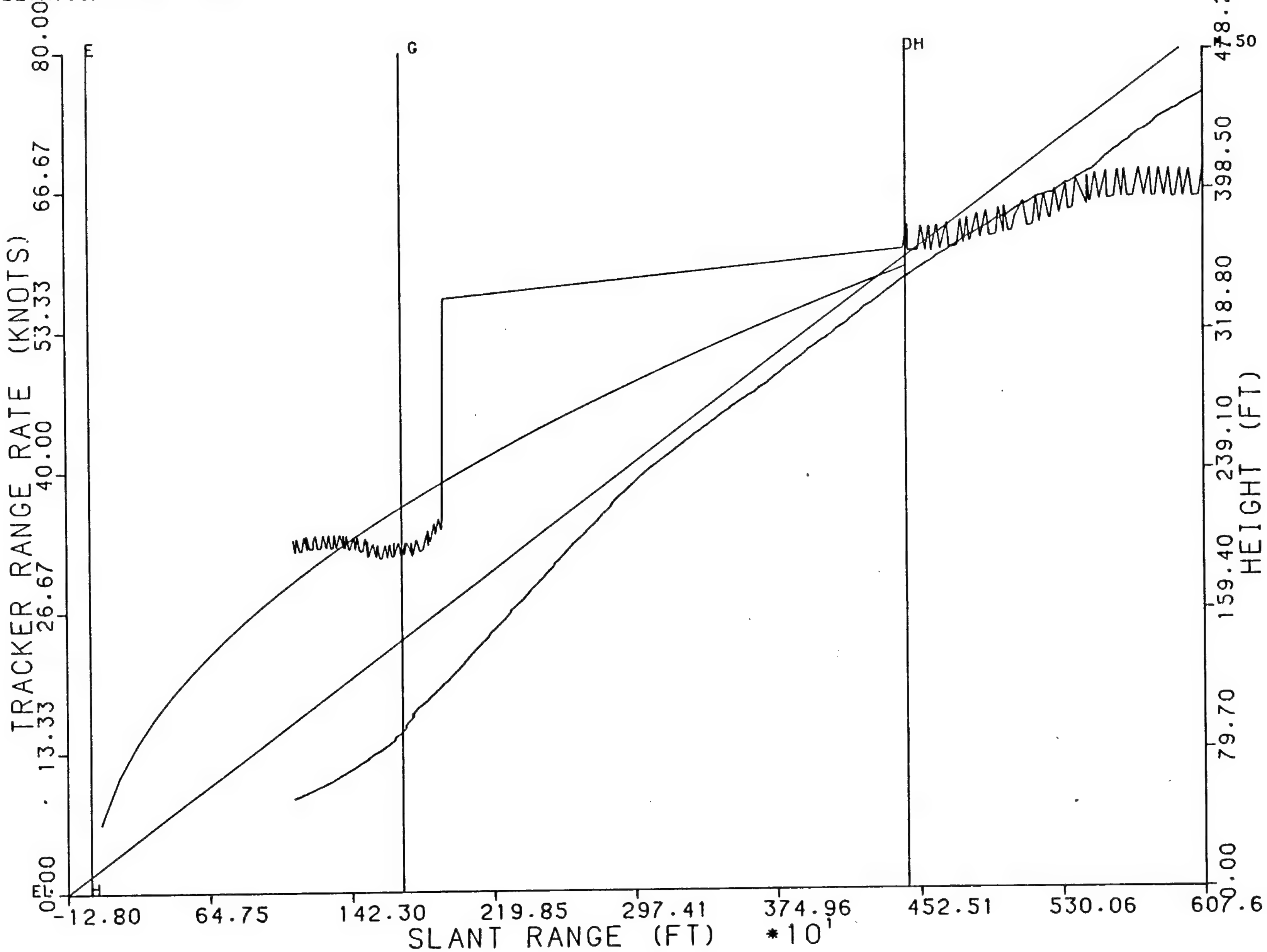

RUN # 7

6/28/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE L AZ ON

AZIMUTH : +- 0.00

ELEVATION : +- 4.50

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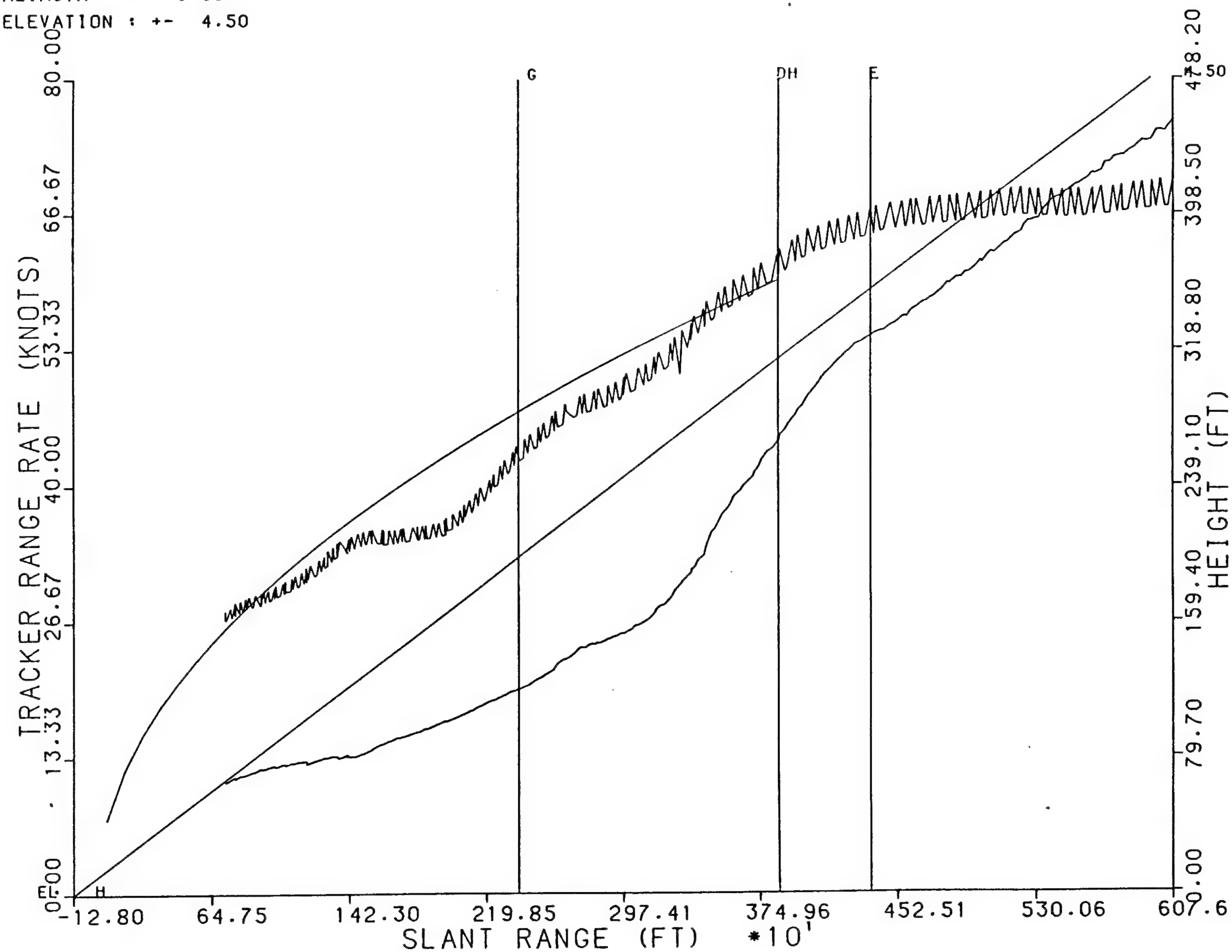

RUN # 9
6/28/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 5 DEGREE R AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

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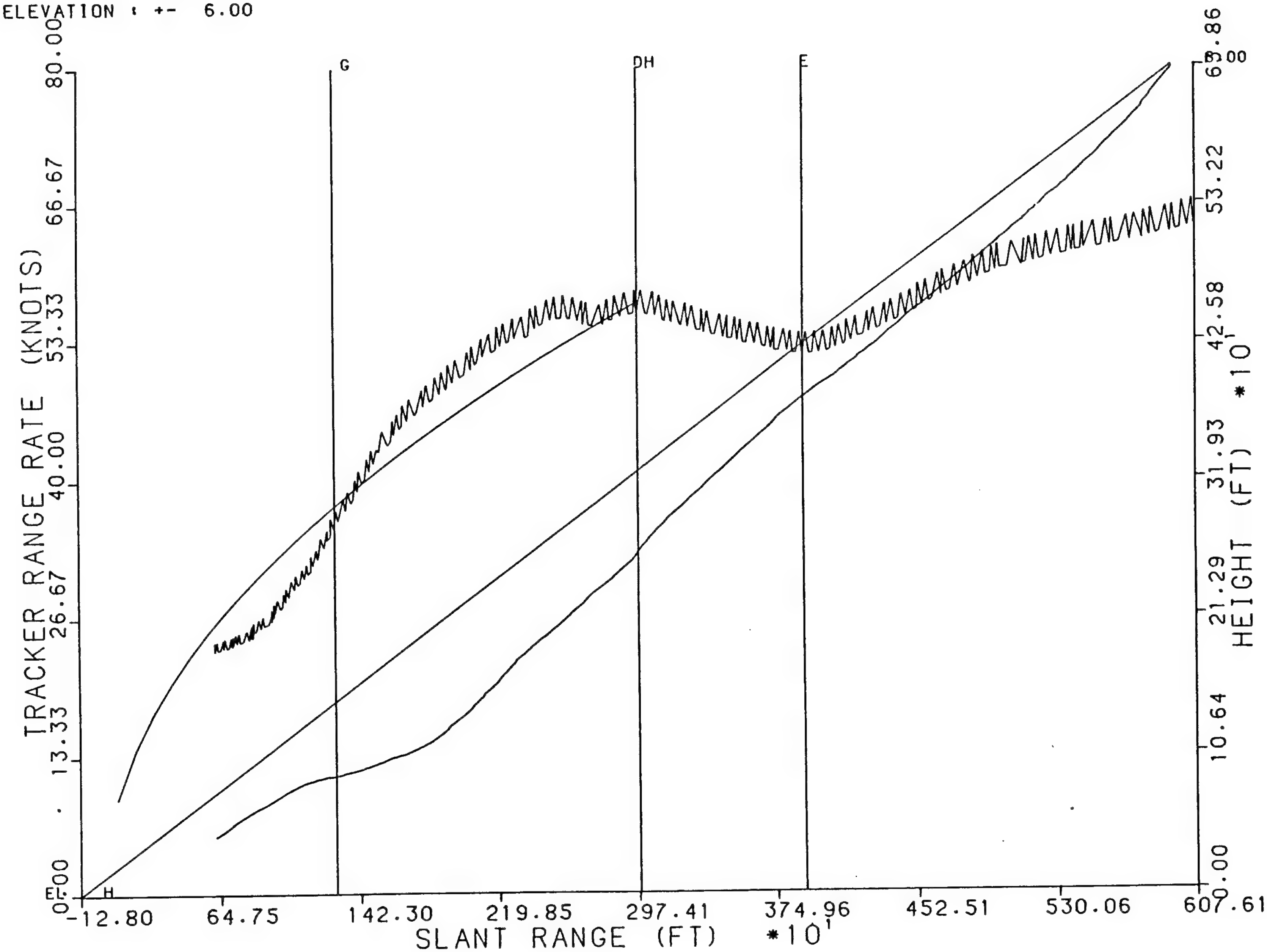

RUN # 10
6/28/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 5 DEGREE L AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

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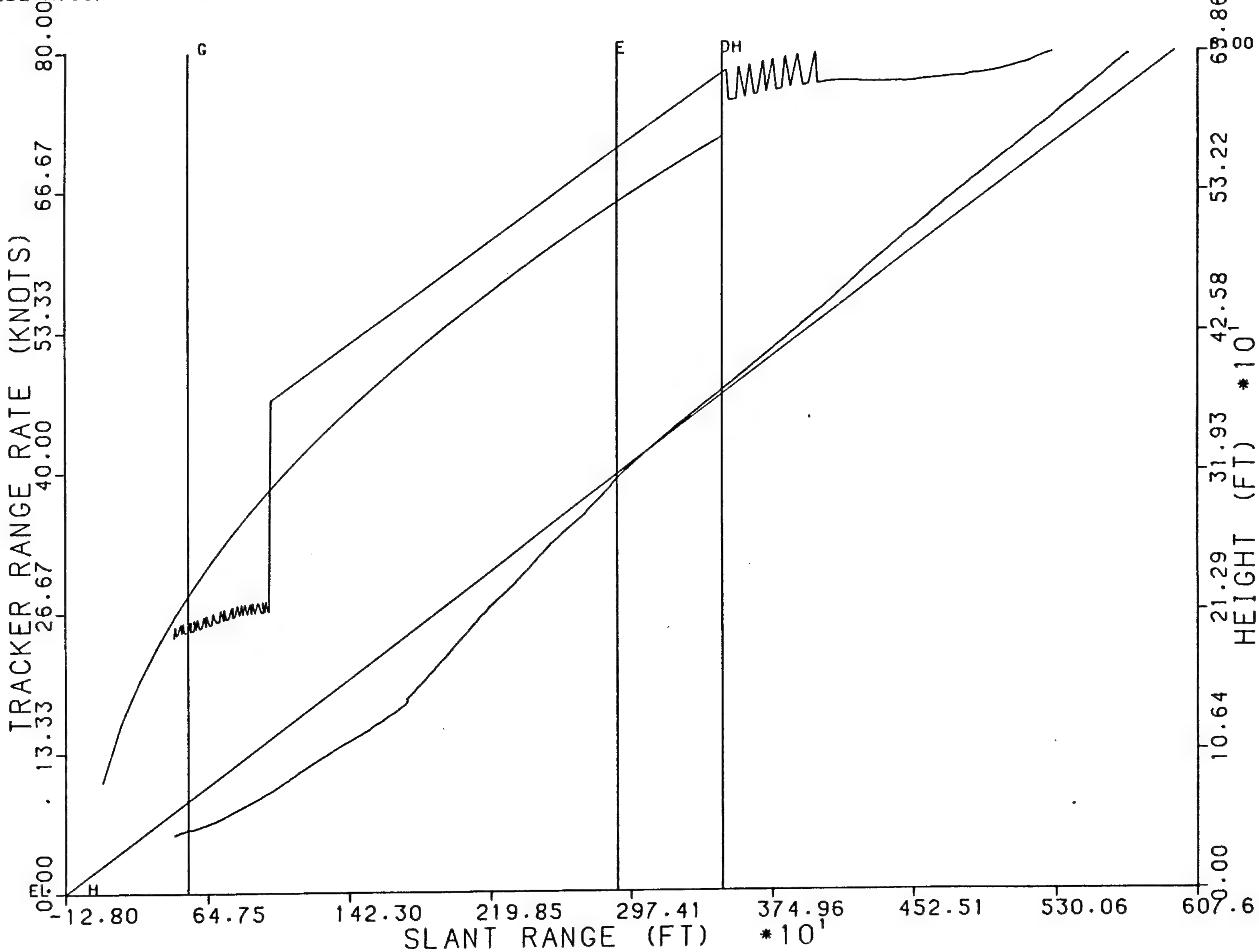

RUN # 1
7/7/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

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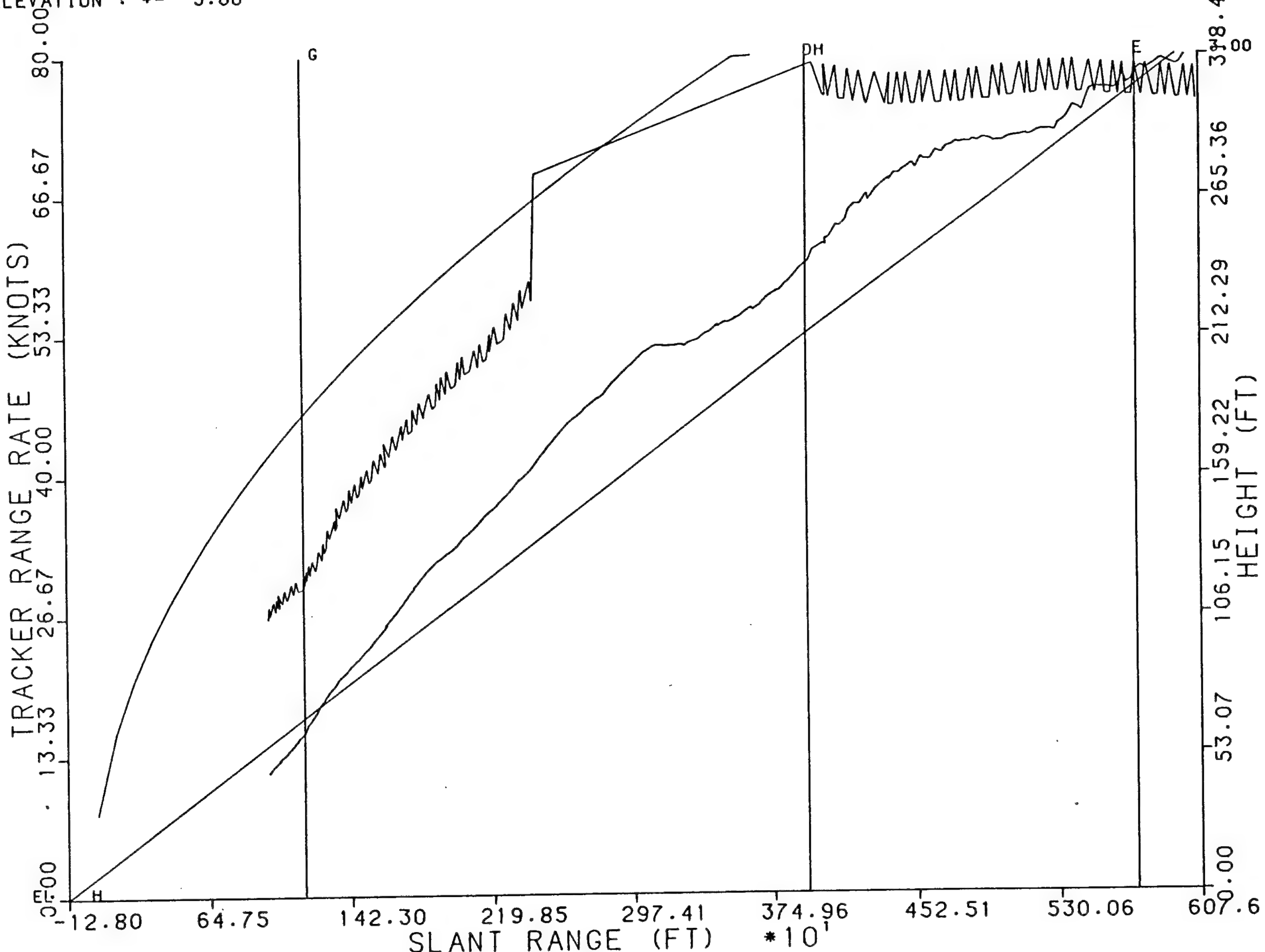

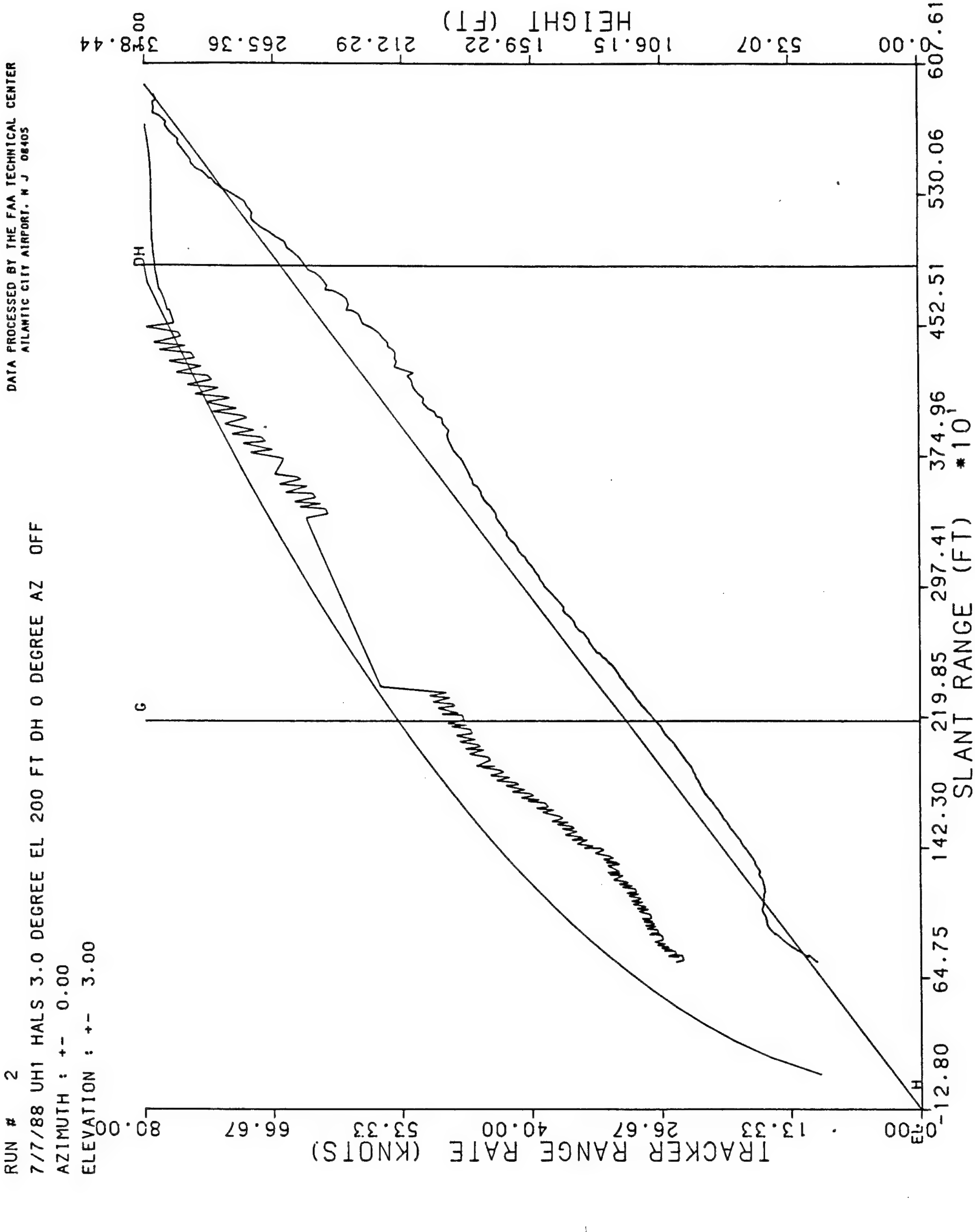
RUN # 2
7/7/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 0 DEGREE AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 3.00
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TRACKER RANGE RATE (KNOTS)
0.00
13.33
26.67
40.00
53.33
66.67
80.00
SLANT RANGE (FT) *10[1]
-12.80
12.80
64.75
142.30
219.85
297.41
374.96
452.51
530.06
607.61
HEIGHT (FT)
0.00
53.07
106.15
159.22
212.29
265.36
318.44
EL
H
G
DH

RUN # 3
7/7/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 5 DEGREE R AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 3.00

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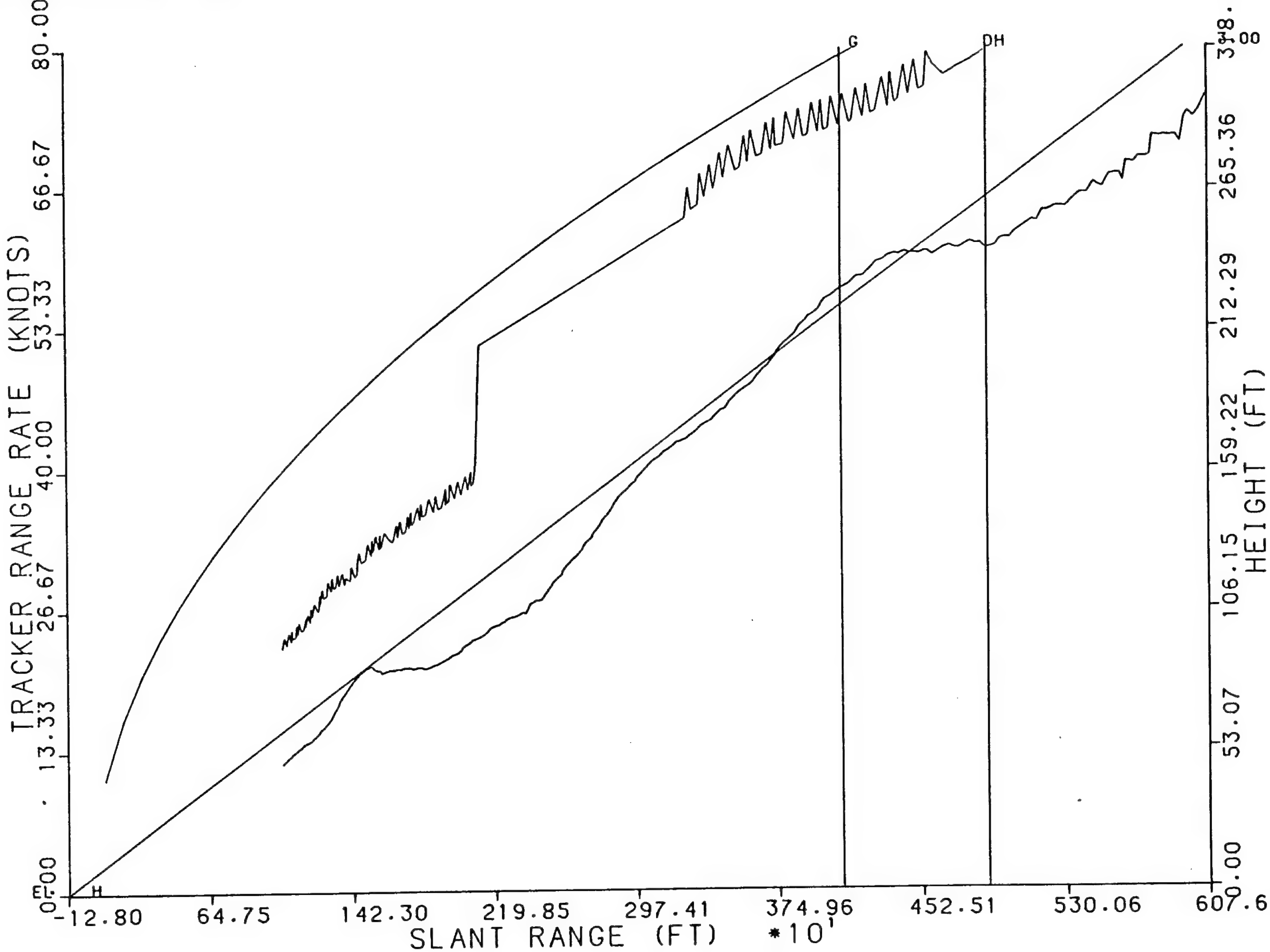

RUN # 4

7/7/88 UH1 HALS 3.0 DEGREE EL 200 FT DH 5 DEGREE L AZ OFF

AZIMUTH : +- 0.00

ELEVATION : +- 3.00

DATA PROCESSED BY THE FAA TECHNICAL CENTER
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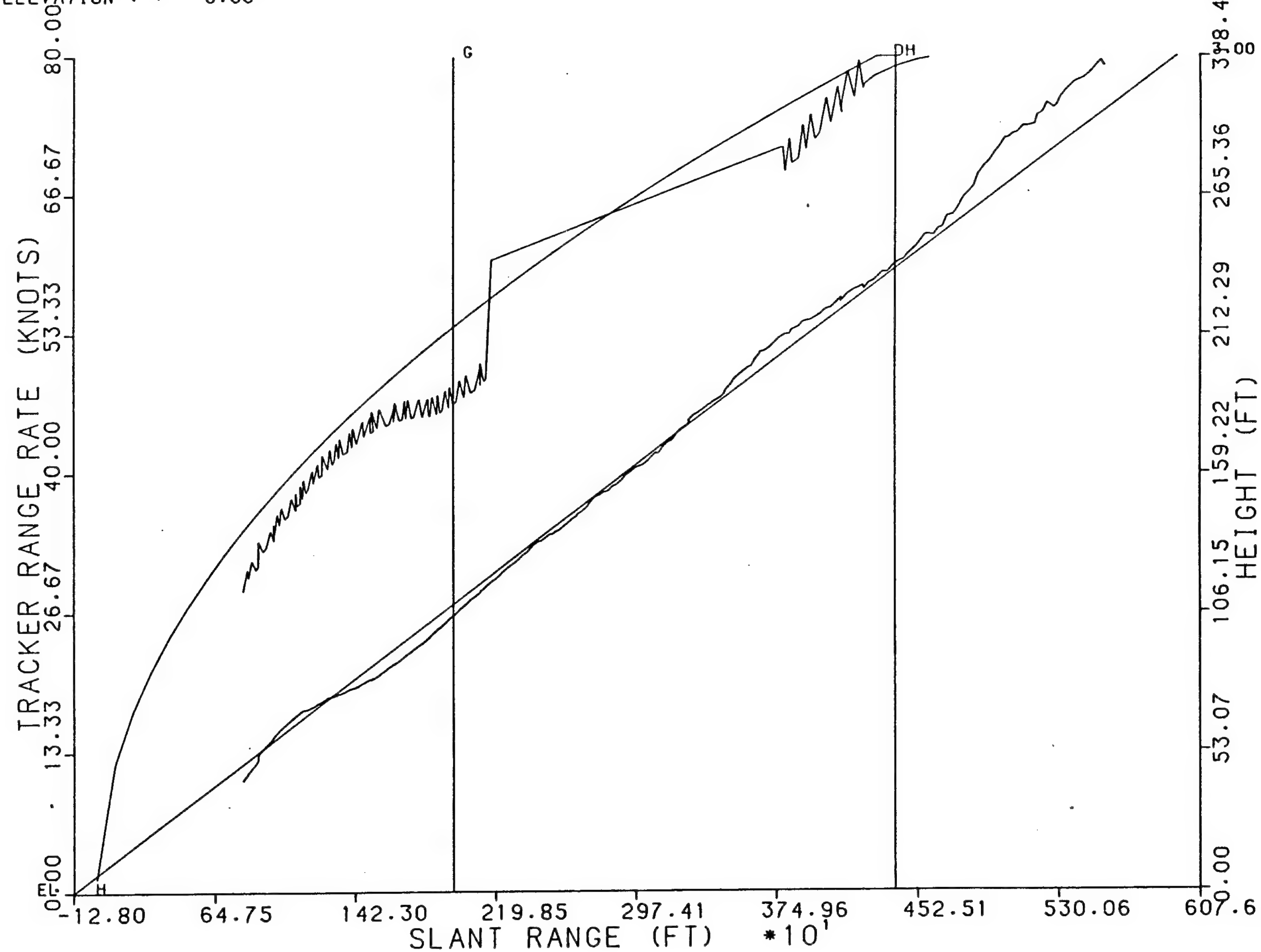

RUN # 5
7/7/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 4.50

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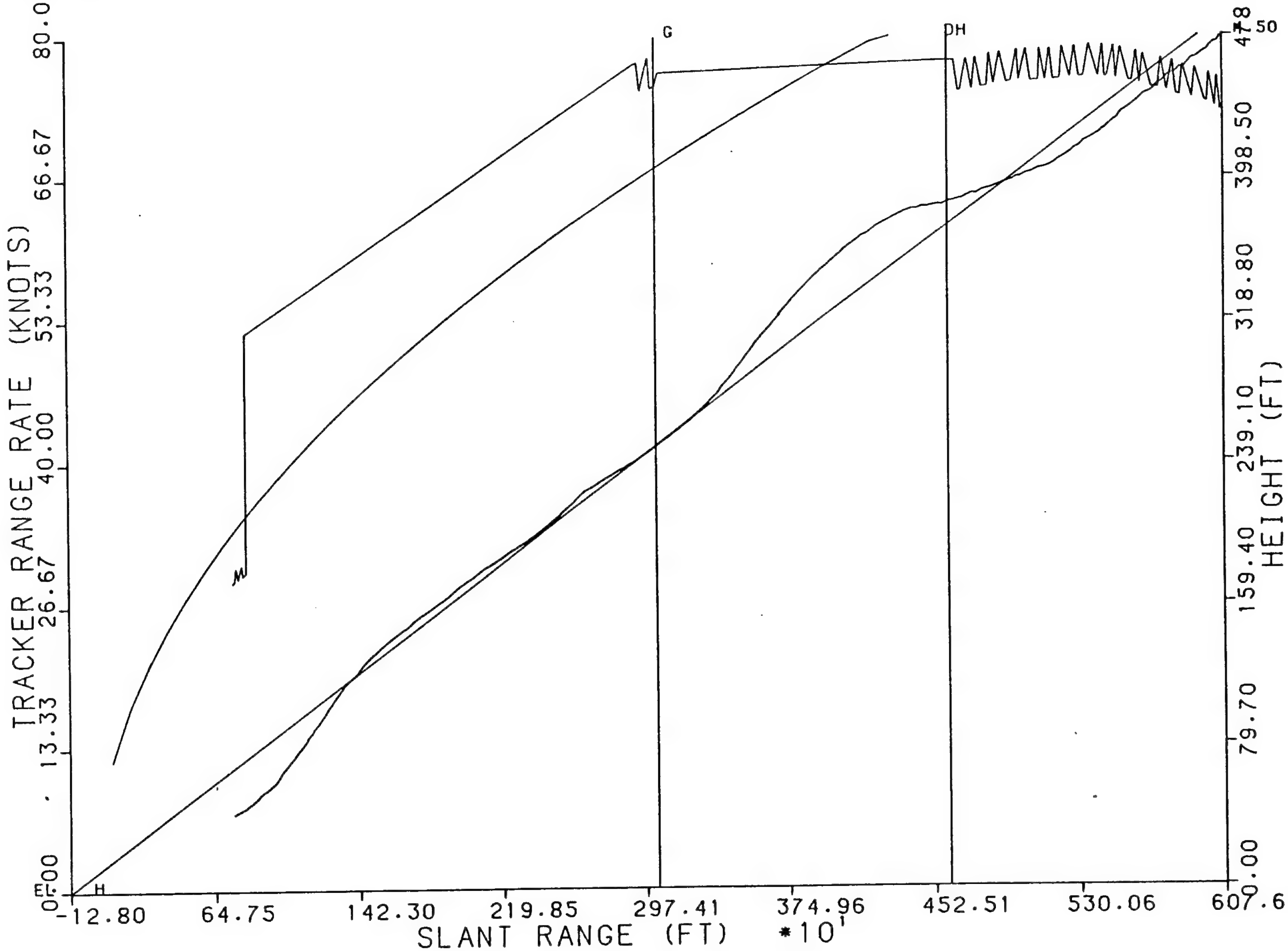

RUN # 6

7/7/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE R AZ OFF

AZIMUTH : +- 0.00

ELEVATION : +- 4.50

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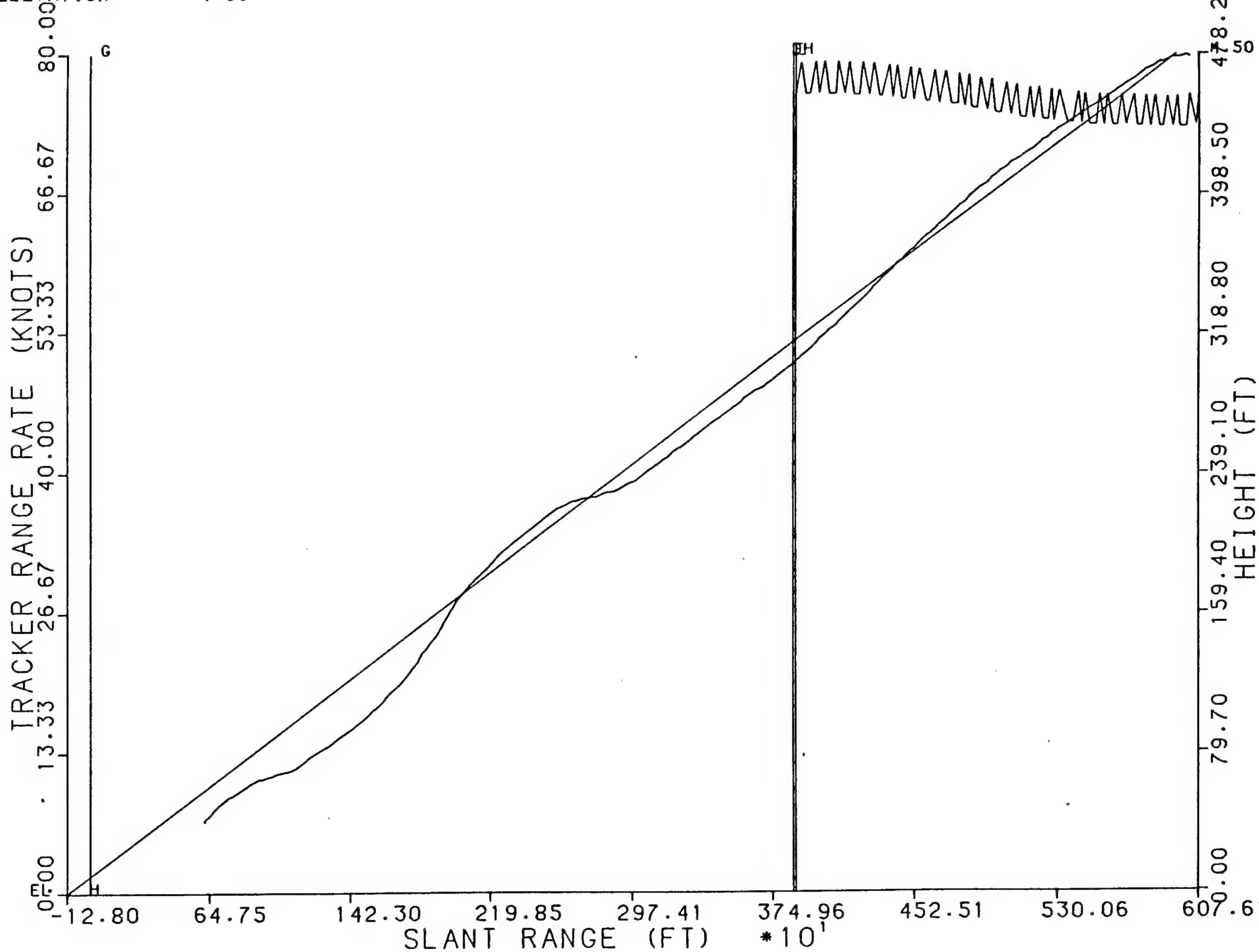

RUN # 7

7/7/88 UH1 HALS 4.5 DEGREE EL 250 FT DH 5 DEGREE L AZ ON

AZIMUTH : +- 0.00

ELEVATION : +- 4.50

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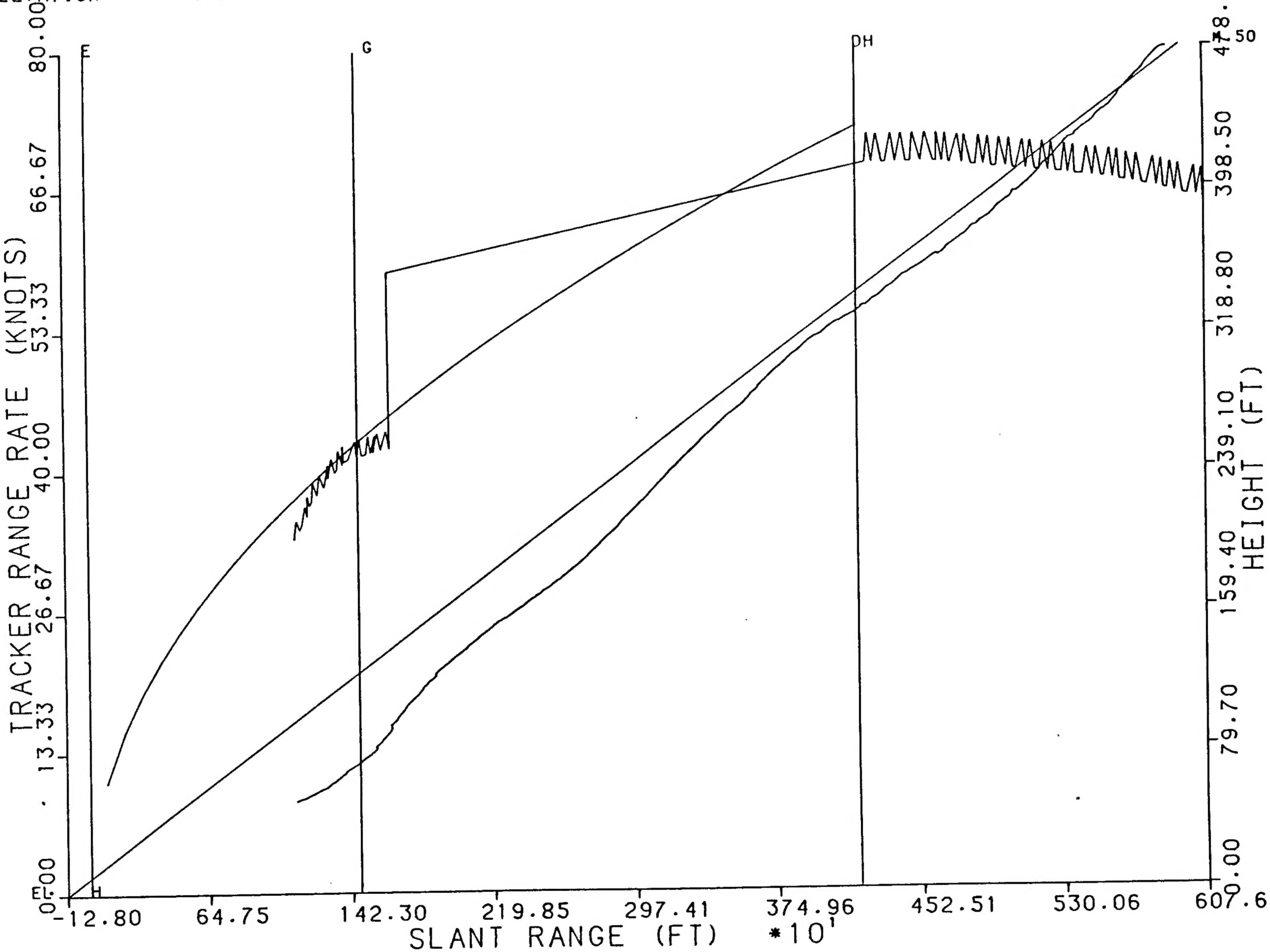

RUN # 8
7/7/UH1 HALS 6.0 DEGREE EL 250 FT DH 0 DEGREE AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

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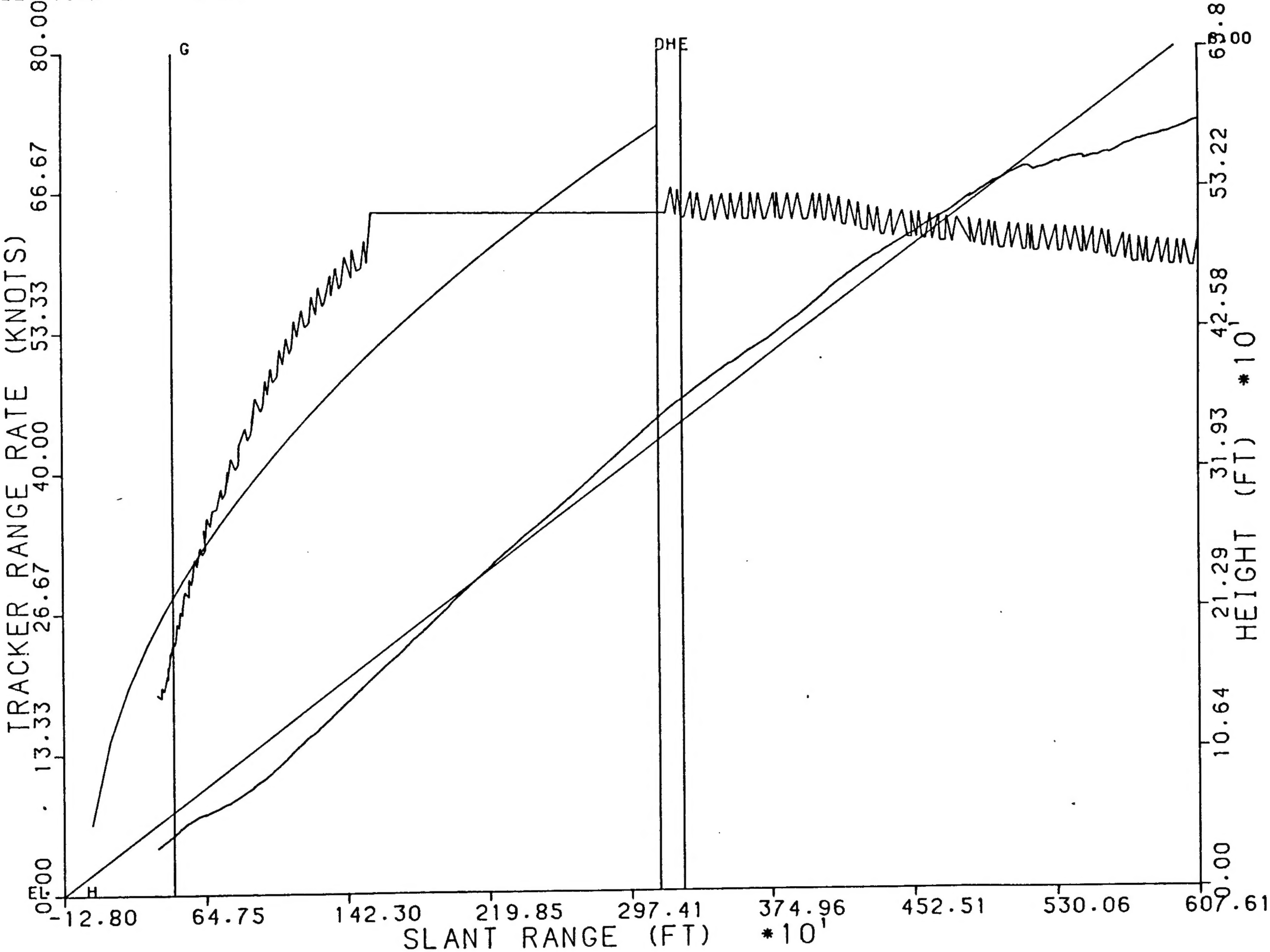

RUN # 9
7/7/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 5 DEGREE R AZ ON
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

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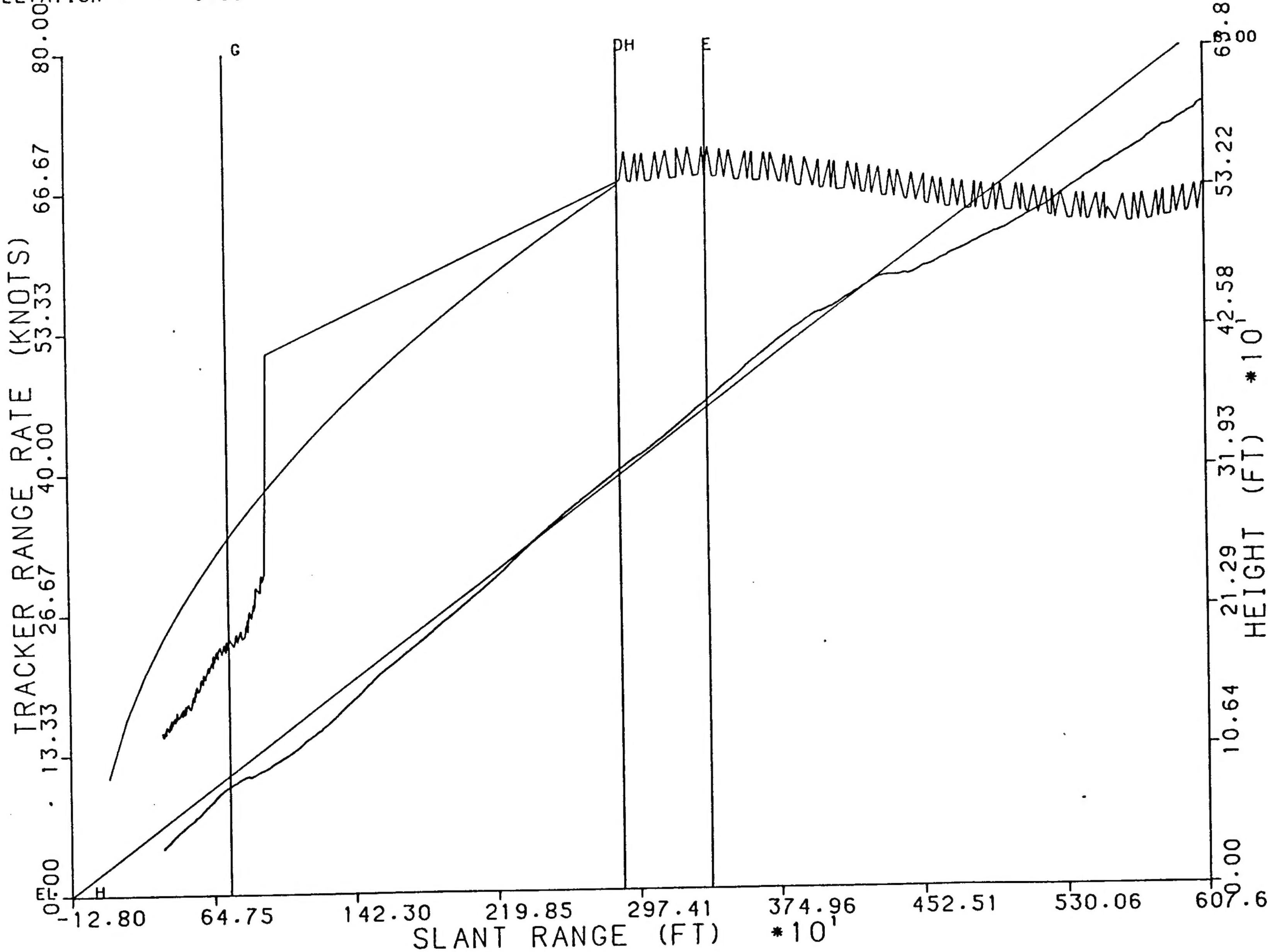

RUN # 10
7/7/88 UH1 HALS 6.0 DEGREE EL 250 FT DH 5 DEGREE L AZ OFF
AZIMUTH : +- 0.00
ELEVATION : +- 6.00

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